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DENGUE FEVER.

By A. S. WALKER, Lieutenant-Colonel, E. MEYERS, Lieutenant-Colonel, A. R. WOODHILL, Captain, and R. N. McCULLOCH, Captain,
Australian Army Medical Corps, Australia.

MANSON-BAHR defines dengue fever as a specific fever conveyed by *Aedes aegypti* and possibly other mosquitoes, occurring usually as a rapidly spreading epidemic. Throughout the febrile stages and often subsequently, severe rheumatic-like pains are a prominent symptom. The disease in its active form lasts about a week and is attended with little, if any, mortality.

HISTORICAL.

No mention of dengue fever can be found in medical history further back than the last two decades of the eighteenth century. The disease was described in Cairo and Batavia in 1779. The first clear description of dengue fever was given in 1780 by Rush, of Philadelphia, who called it "break-bone fever". The Spaniards gave the infection the name of dengue, which corresponds to the English word dandy, used on account of the "dandified" gait of the patient.

Dengue fever is endemic in tropical countries and spreads to subtropical and temperate countries in the form of epidemics. Three great pandemics of the fever have occurred, in 1780, 1824 and 1870. Between these pandemics only isolated outbreaks of the disease have been observed in various countries; periodically it seems to disappear entirely from all countries.

GEOGRAPHICAL DISTRIBUTION.

The geographical distribution of dengue fever is extensive, and it is possible that the disease is more widely distributed than is usually believed. Wherever *Aedes aegypti* occurs dengue is likely to break out; hence its widespread occurrence in the tropics and subtropics. The permanent reservoir of the disease is probably in those countries which lie near the equator, where the conditions are favourable for its existence throughout the year. The further from the equator, the less likely are the conditions to be favourable to its continued existence, so that in places like Philadelphia or Greece or the northern part of New South Wales the disease may be completely absent for years; then, if the climatic conditions happen to be suitable (that is, for the abundant breeding of the mosquito) and infection is introduced, the disease will spread most rapidly among the susceptible population. Places which are situated at shorter distances from the equator show an intermediate state of affairs; for example, in Calcutta the disease is seen every year in the form of sporadic cases, which occur chiefly among newcomers, but from time to time epidemics break out. Perhaps this can be explained by the fact that after each epidemic the population is left with a considerable degree of immunity; however, the immunity following an attack of dengue fever is short (about four to six months), so that there is a gradual increase in the number of susceptible persons, and when this number reaches a certain proportion, the infection once more breaks out in epidemic form. In this regard, it is to be borne in mind that three essential factors are necessary for an outbreak of mosquito-borne disease: (i) existence of infection, either in human beings or in mosquitoes which have previously bitten infected human beings; (ii) existence of

the vector mosquitoes in sufficient numbers; (iii) existence of a sufficient number of susceptible persons in a community.

Eastern Australia.

Dengue fever was first reported in Australia at Rockhampton, Queensland, in 1885. It occurred in Thursday Island in 1894. It then appeared at Townsville, where it was prevalent in 1895. In 1897 and 1898 the disease was prevalent throughout the whole of Queensland, several epidemics occurring in quick succession. It invaded the far north coast of New South Wales in the latter year. A severe epidemic swept Queensland in 1904-1905, reaching the far north coast of New South Wales in 1906. There was a further extensive epidemic in Queensland in 1916, and again the far north coast of New South Wales was invaded. In 1925-1926, the whole of Queensland and a large portion of the northern part of New South Wales were swept by an extensive epidemic. There have been occasional smaller epidemics and sporadic cases of dengue fever in Queensland between the outbreaks mentioned. Queensland is now experiencing an epidemic, which commenced at the end of 1941. One town on the far north coast of New South Wales has already been affected, and at the time of writing (July, 1942) cases are still occurring. Although the disease has shown some tendency to spread south, it has so far been kept under control; but with the onset of warmer weather an epidemic can be expected, unless measures for the control of the vector are instituted without delay.

EPIDEMIOLOGY.

Dengue fever is apt to occur in epidemic or pandemic waves at intervals of years, during which a large percentage of the population is affected. When it occurs in epidemics in tropical or subtropical climates, the epidemic may last for merely one season or be spread over several years. Between these epidemics sporadic cases may occur, and these will form a nidus of infection for further epidemics. These cases are not necessarily diagnosed as of dengue fever. It would appear that when an epidemic spreads into temperate regions, it lasts only for the one season. The geographical distribution of dengue fever is, of course, dependent upon that of the vector of the disease, but generally it is rather less extensive. When dengue appears beyond its normal tropical limit, the extension generally occurs during the hottest part of the year—that is, the late summer and early autumn.

ATIOLOGY.

In 1907, Ashburn and Craig demonstrated that dengue fever was caused by a filtrable virus. Earlier, in 1903, Grahame at Beirut, Syria, had conveyed the disease to volunteers by the bites of mosquitoes, which had previously fed on persons suffering from dengue fever. He described the mosquitoes as *Culex* mosquitoes; but it is quite possible that infected *Stegomyia* mosquitoes may have been included among his laboratory insects, as the knowledge of the classification of mosquitoes was rather vague at the time.

In 1916, Cleland, Bradley and McDonald, in New South Wales, conveyed the disease to four out of seven persons living in non-infected areas by the bites of *Aedes aegypti* mosquitoes, which had previously fed on dengue patients. They failed to convey infection to two other persons who were bitten by the mosquito *Culex fatigans* under similar conditions. By subinoculation from one subject to another, the disease was transmitted for four generations, and the workers showed that the virus was present in the blood from the second to the fourth day of the disease. In 1924, Siler, Hall and Hitchens, carrying out careful experiments in Manila, showed that dengue occurred in 25 out of 42 persons who were bitten by infected *Aedes aegypti* mosquitoes. They showed that patients infected mosquitoes from eighteen hours before the onset of the fever to the end of the third day of the illness. It was further demonstrated that the mosquito *Aedes aegypti* did not become infective for eleven to fourteen days, but that once it became

infected it remained so for the rest of its life. *Culex* mosquitoes failed to infect susceptible persons. During the course of this experiment, it was further shown that one attack of the disease gave rise to a certain degree of immunity. Of persons reinfected after one to four months, about 50% were immune and the others suffered from second attacks which were much milder than the first.

PATHOLOGY.

Little is known of the living pathology of the disease, as few post-mortem examinations have been made. Signs of intracranial inflammation have been observed, with changes of the encephalitic type, and some meningeal congestion. Morbid changes in the kidneys, chiefly causing degeneration of the tubular elements, have also been noted. The lymph gland nodes have been found to show inflammatory changes and enlargement. Many of the deaths recorded with dengue fever as a contributory cause are no doubt due to other pathological lesions, but are accelerated by the final illness.

CLINICAL FEATURES.

Dengue is not unfamiliar to many medical practitioners in Australia, particularly in the north-eastern parts. Sandfly fever, which is a closely related disease, is also familiar to a number of medical officers who have been in the Middle East during the summer months. During an established epidemic its recognition will probably be perfectly simple; but diagnosis may be much more difficult as the disease begins to infiltrate wider areas, for it may not be suspected, and also it may exist in mild or non-typical forms. The word "non-typical" is indeed inaccurate. The epidemic disease tends to vary in its manifestations, not only from epidemic to epidemic, but also during any one given outbreak. The writers on dengue fever lay stress on this mutability of the clinical picture, and study of the naturally occurring and experimentally produced disease shows that there are few if any necessary pathognomonic signs or symptoms. The incubation period is about four to seven days in most cases. Except in the mild forms of this malady, prostration is rapid, severe and characteristic. True rigors are rare; but shivering sensations are usual. Prodromal malaise and pain in the limbs may be noticed for a few hours. Once the attack is in full swing—that is, soon after the onset—the patient appears flushed, sometimes even cyanosed; his face is puffy with suffused eyes; and Siler, Hall and Hitchens, who made a detailed study in the Philippines, remark that the aspect is curiously dull and expressionless. Headache, lumbar pain and aching and tenderness of the eyes are usually present. As in sandfly fever, the eye muscles are the site of pain and tenderness, and eye movements are uncomfortable. Photophobia is common. Catarhal signs form no part of the established picture, but there may be some congestion of the mouth and throat, and even small erosions in the severer cases. The vesicular eruption on the palate so frequently seen in sandfly fever is absent. Labial herpes is not characteristic, but may occur. Pain in the body and limbs may be merely troublesome or extremely severe and persistent. Joint pain and even joint swellings are described in some epidemics; but actual involvement of joints is by no means characteristic.

Pain is often localized in muscular and tendinous attachments. This feature, combined with the toxic effect of the disease on the central nervous system, produces an unhappy restlessness. The lymph nodes are often enlarged; sometimes this sign is conspicuous, sometimes it is absent. Enlargement of the spleen has been rarely noted; but it is open to doubt whether in such cases it is really due to dengue fever at all, rather than to some other condition such as malaria. The presence of an enlarged spleen does not *per se* suggest dengue. The toxic nervous manifestations are interesting and definite. Included under this heading are headache, irritability, restlessness and insomnia, delirium in the severer cases, depression (observed so constantly during convalescence), pain in body and limbs, vertigo and loss of sense of taste. It will be observed that these symptoms are not *per se* characteristic

of dengue or any single disease, for they are common in other virus infections.

Fever is perhaps the one sign which is invariable; but its type is by no means invariable. Too much stress has been laid on the intermittent and "saddle-back" types of temperature chart. It is true that some degree of intermission in the fever is common. This may amount to a temporary remission with normal temperature, or merely to a "dip" in the chart, and as such it is a diagnostic help, but it is by no means a constant feature. Continued forms of fever occur, lasting up to a week, and short forms lasting only one to three days are common in epidemics. The usual duration is about four or five days in cases of moderate severity. The pulse rate, as in sandfly fever, shows slowing as a quite constant feature. An absolute bradycardia is not unusual, the rate being even as low as 40 per minute in some cases, and failing this, a relative slowing of the heart rate even before the temperature has completely fallen is common. The rashes of dengue fever have attracted a good deal of notice; they are an important diagnostic feature, but must not be considered invariable. The initial or primary rash is often fleeting, and may be missed, especially as it is a simple erythema. It is not constant. The secondary rash, which may occasionally be present from the early stages, is usually seen when the temperature begins its secondary rise. It is polymorphous in nature, usually macular or morbilliform, or it may be maculopapular. Petechial rashes and even purpuric forms are also described. A feature noted by many observers is a curious and rather characteristic lace-like pattern on the skin, caused by the interspacing of white islands of normal skin between the pink or dusky areas of eruption. Desquamation is common and may even occur in cases in which the rash is evanescent. The rash usually lasts for several days, but may persist for longer, especially in the form of patchy discolouration. A curious feature is the not infrequent occurrence of itching and formication. Leucopenia, a well-known concomitant of several virus infections, is common in dengue fever. Siler, Hall and Hitchens noted in 25% of their cases no sign of a lowered number of leucocytes, and observed that very little change in the total number or proportion of white blood cells might be found shortly after the onset; this sign must therefore not be relied upon. The leucopenia is due to diminution in the number of granular cells, and no variation in the differential count is to be expected unless the total number of leucocytes is lowered. Rarely the total number of white cells may be 3,000 per cubic millimetre or less. The cerebro-spinal fluid has been found to be under pressure during the acute febrile stage when headache is severe, but no other abnormality is usually found.

The complications of dengue fever are not many, nor are they common. Pericarditis, arthritis and orchitis have been observed; but except for the effect of the impact of a potentially (if briefly) exhausting fever on the very young and the old and debilitated, no malignant effects may be expected. A definite though small death rate has been recorded; but in a military population this should be negligible. The most troublesome feature is likely to be the continuance of morbidity over a period of one to three weeks after recovery from the fever. An aftermath of troublesome pain in the limbs is an occasional and annoying episode of convalescence; but perhaps more common and equally prostrating is a state of temporary depression.

DIFFERENTIAL DIAGNOSIS.

Difficulty in diagnosis will arise in two ways. On the spreading edge of an epidemic, cases of dengue fever will probably pass for influenza or other catarrhal infections or for one of the exanthems. At the height of an epidemic every febrile disease may be labelled as dengue fever. Further, many cases of a so-called non-typical variety will be encountered, and it may be impossible to be sure of the mild cases. Influenza and similar infections also appear in epidemics, and in these, the prevalence of catarrhal or respiratory symptoms and the absence of rashes should make the diagnosis clear. Cerebro-spinal

meningitis may easily be confused with dengue fever, owing to the presence of cerebral symptoms and pains in the neck and head in dengue fever and to the occurrence of an early rash in some cases. Careful examination usually reveals the true neck rigidity in doubtful cases of meningitis; but, of course, if serious doubt exists, lumbar puncture will settle the matter. The exanthematous diseases may easily cause confusion, especially when glandular enlargements are present. It is specially important to distinguish measles from dengue fever, in view of the frequent occurrence of the former under military conditions. The absence of Koplik's spots and of respiratory symptoms and signs should help to establish the diagnosis of dengue fever. The chief diagnostic requirements are to think of dengue fever in any likely circumstances, to consider the question broadly if other suspicious cases are seen, and to avoid making a diagnosis on the strength of any one sign or small group of signs. Doctors who have seen cases in a local epidemic are prone to pin their faith to some favoured criterion; but the notoriously changeable picture in all epidemic diseases, and particularly in this disease, shows the need for balance and caution.

TREATMENT.

There is no specific treatment. Rest in bed, simple analgesics, sedatives when required, a sufficient convalescence—these are the mainstays. The salicylate group of drugs and phenacetin will probably supply most needs. The addition of codeine in small doses acts synergically in cases in which pain is severe, but the usual cautions apply with regard to narcotics. In the present national emergency, the greatest service the medical profession can render in the treatment of a relatively non-serious and practically non-fatal disease like dengue fever is to relieve the patient's symptoms by simple means, to ensure that he runs no risk of pain or an unduly prolonged convalescence, and in their prescribing to conserve supplies of scarce drugs and to refrain from the use of proprietary preparations whose value is not commensurate with their expense.

THE VECTOR.

The vector in Australia is the dengue fever mosquito *Aedes (Stegomyia) aegypti* Linnaeus. A related species *Aedes (Stegomyia) albopictus* Skuse was shown to be a vector in the Philippines (Simmons, 1930), and has been recorded from North Australia (Taylor, 1934), but is not known to transmit fever in that area.

Geographical Distribution.

Aedes aegypti is found throughout the tropics and subtropics. In some countries it has a relatively extensive "summer range", from which it is killed out by winter cold, to be reintroduced annually. In less continental climates, adults may disappear in the winter, while larvae or eggs or both survive. In Australia the recorded southern limits are Perth, and for New South Wales, Narrandera, Junee, Breadalbane and Bargo, the known western limits in this State being Merriwagga and Bourke. It has not been found closer to Sydney than Liverpool, and it is rare at Newcastle.

In May, 1942, an *Aedes aegypti* larva was found at Blayney (at a height of 2,800 feet above sea level), and larvae were abundant in one section of Bathurst (2,200 feet). By the middle of June the latter had died when in shaded tanks with water temperatures of 40° to 45° F., but survived in warmer tanks with water temperatures of 47° to 53° F. A study of the climate of New South Wales and the recorded reactions of *Aedes aegypti* to cold lead to the opinion that while adult insects may disappear in winter, eggs and probably larvae may be expected to survive in the greater part of the "occupied" area of the State.

Description.

The adult (Figure I) can be readily recognized by the lyre-shaped white markings on the dorsal surface of the thorax and the dark proboscis. The only other mosquito

likely to be confused with this species over the greater part of Australia is *Aedes (Finlaya) notoscriptus* Skuse, which has somewhat similar markings on the thorax, but has a distinct white band on the proboscis.

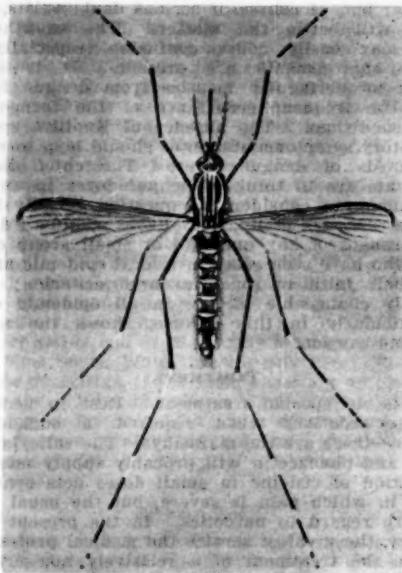


FIGURE I.
Aedes aegypti Linnaeus, female.

The larva (Figure II) has a rather characteristic appearance and type of movement, but can be identified with certainty only by an examination of the terminal segments under high magnification, when the structures shown in Figure III can be seen.

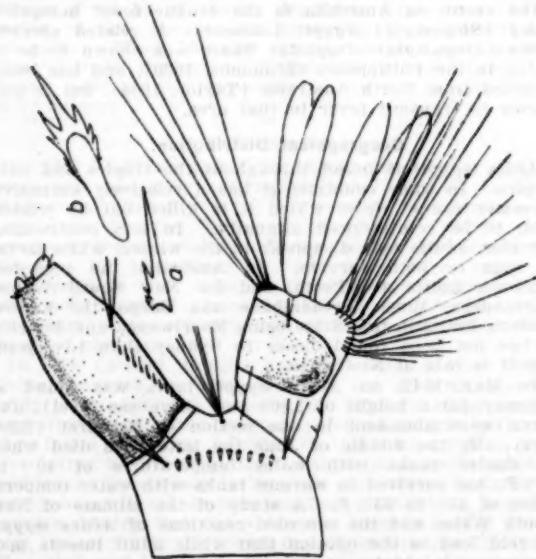


FIGURE III.
Aedes aegypti Linnaeus. Mature larva, terminal segments.
(After Woodhill and Pasfield.)

Development: Bionomics.

The eggs (Figure IV) are deposited either on the surface of the water, or more frequently, at the margin of the water or above the water surface; they will remain

viable in a dry state for as long as twelve months, hatching as soon as they are submerged. The duration of the egg stage, when the eggs are deposited on the water, is

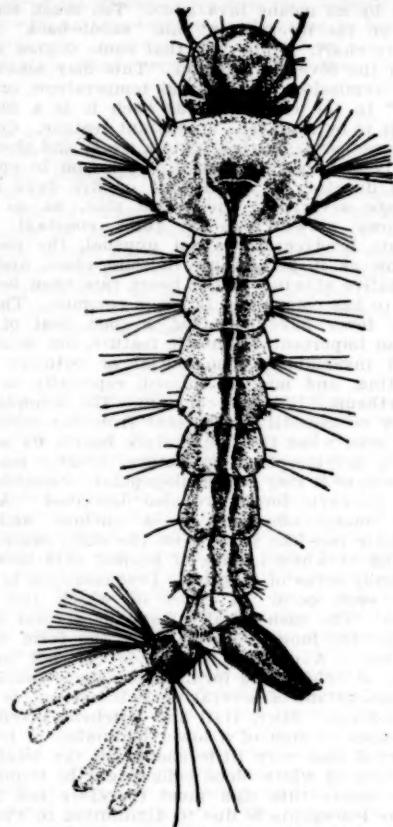


FIGURE II.
Aedes aegypti Linnaeus. Mature larva.
(After Bishop.)

approximately two days. The eggs are laid in batches of 30 to 150, and one female may deposit from one to seven batches, provided she can obtain blood feeds. Under

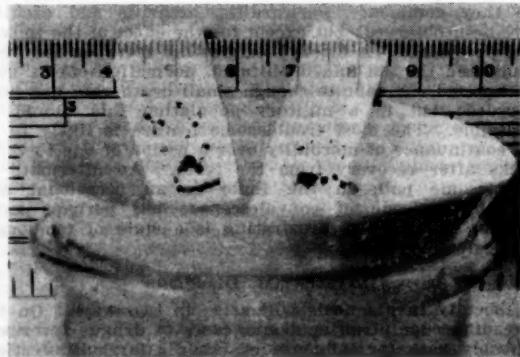


FIGURE IV.
Aedes aegypti Linnaeus. Eggs on filter paper; millimetre scale in background. (Photograph by G. Burns, Zoology Department, University of Sydney.)

optimum conditions of temperature and food the larval period may be passed in six days and the pupal period in thirty-six hours—a total period from egg to adult of nine

and a half days. This, however, is exceptional; the average period during the summer is usually from eleven to eighteen days, and this may be considerably prolonged by cool weather.

Longevity.

Under suitable conditions the females may remain alive for several months, the longest period recorded apparently being 215 days. Having fed on a dengue fever patient, they may remain infected till death.

Daylight and Temperature.

Aedes aegypti is often called "the day-biting mosquito", and is in fact the only one to make its biting obvious in houses in the daytime in New South Wales, but it attacks by night also if not made inactive by cold. Biting is at its maximum at 80° to 85° F., is reduced at less than 65° F. and ceases at about 55° F.

Adults have lived for thirty days at 50° F., for less than one day at 42° F., and for one hour at 39° F., and have died in a few minutes at 32° F. Larvae have survived freezing at 28° F. for ten hours and eggs have survived freezing at 30° F. for nearly forty-eight hours. Eggs have overwintered at Stillwater, Oklahoma, where on the coldest day of the year the lowest temperature was 8° F. and the highest 32° F.

Range of Flight.

The longest recorded flight is 1,000 to 1,100 yards, but the normal range is much less. *Aedes aegypti* is rarely found away from houses with suitable breeding places. In the outer suburbs of Sydney, where there are some rain-water tanks, but usually at least a quarter of a mile apart, it seems incapable of spreading. On the other hand, the adults readily enter trains, motor cars, boats or aeroplanes, and are thus transported for long distances.

Breeding Places.

Aedes aegypti is a domestic mosquito, breeding in and around human habitations in water occurring in artificial containers, such as rain-water tanks, barrels, buckets, cisterns, vases, jugs, tins, bottles, defective roof gutters *et cetera*. It also breeds in tree holes near dwellings, but never in swamps, puddles or any other type of ground water. In New South Wales—even in the coastal districts—domestic tanks are overwhelmingly important. It is probable that in that State *Aedes aegypti* is able to breed in small bodies of water only where the population is maintained through dry periods by tanks, and some very much less important permanent bodies of water—for example, fire buckets.

Control.

Because of its breeding habits and range of flight, *Aedes aegypti* is less difficult to control than other Australian pest mosquitoes. The universal domestic brown-coloured *Culex fatigans*, for example, can use all the waters available to *Aedes aegypti*, and occurs in huge numbers in polluted drains and swamps as well. The black coastal bush pest *Aedes vigilax* breeds in swamps and can fly for several miles. Species of *Anopheles* have a relatively wide range.

An individual town or a country homestead can be rid of *Aedes aegypti*; but the individual town householder can be protected only if all his neighbours play their parts. The aim should be eradication.

Control Methods.

Control methods may be classed as (i) the prevention of breeding, (ii) the attacking of adult mosquitoes and (iii) the protection of human beings.

Prevention of Breeding.—In the prevention of breeding the screening of tanks and barrels used for water storage should be the first line of attack. Entrance and overflow openings should be covered with eighteen mesh (or finer) gauze. Elaborate double screens with an upper coarser (four mesh) sieve, to prevent the choking of the gauze by leaves *et cetera*, have been designed, and plans are available in leaflets of the Departments of Health. But

a simple sheet of gauze soldered horizontally over the man-hole in the top of the tank has proved satisfactory for many homes. Screening is the outstandingly useful method, as has been demonstrated admirably by a number of towns—notably Tamworth and Inverell; but the relatively sudden adoption of this method by large numbers of people presents considerable difficulties in the supply of material and skilled labour. Permanent domestic water containers may therefore have to be dealt with largely by oiling. Oils vary greatly in their ability to spread on water and kill larvae contacting their films, while the organic matter content of any water influences the nature of the film formed by any oil. Fly spray (kerosene with pyrethrum extract) is excellent, because it spreads exceptionally well and kills larvae in less than an hour. Lighting kerosene spreads relatively poorly (a greater quantity and more careful mechanical spreading being required) and larvae may be alive under it after several days, though they cannot survive after they have contacted the film. Other oils, like special mosquito mixtures designed for swamps, are less suitable because of taint and colour. The recommended method of oiling is therefore to use fly spray at the rate of one tablespoonful, or lighting kerosene four tablespoonsful, to a tank six feet in diameter (nearly thirty square feet), if the film can be swept over the surface by means of a stick. If such sweeping is impossible the dosage should be doubled. Though in some climates a longer interval may serve, it is recommended that oiling be carried out once a week. Other water containers about dwellings should be emptied every week or permanently. Examples of what is necessary are the following: the correcting of faults in guttering, or the puncturing of the lowest part of a sagging section to let water drain out; the burying or flattening or breaking of waste tins or bottles, the storing upside down of vessels used only periodically. Points likely to be overlooked are that *Aedes aegypti* will breed readily indoors (in neglected flower vases *et cetera*) as well as outside, and that its larvae are capable of clinging to the bottom of an upturned vessel to continue development if the vessel is immediately refilled. Fish (goldfish or *Gambusia*) have a limited field in the control of *Aedes aegypti*, but they may be used in ornamental pools. Water in fire buckets or other water never to be used for drinking may be rendered unsuitable for mosquitoes by the addition of phenolic emulsions. Concentrations of one part of cresol in 30,000, 50,000 or even 100,000 parts of water have been said to give control. Of Australian phenolic emulsions considerably higher concentrations appear necessary, though the problem has not been worked out. When this type of larvicide is especially convenient, it is suggested that the locally available emulsion should be tested at a dilution of 1 in 5,000 (1 ounce per 31 gallons). Its value may be judged by its killing or failing to kill larvae in twenty-four hours and the concentration varied accordingly.

The Attacking of Adult Mosquitoes.—The attacking with fly spray of adults of *Aedes aegypti* in houses is an essential part of the campaign, since in the extreme cases adults may live for seven months after the destruction of breeding water. Spraying without the simultaneous prevention of breeding, however, even in a screened house, is inefficient from the point of view of human comfort and probably of little use in the control of dengue fever.

Protection of Human Beings.—The nursing of dengue fever patients under nets for at least four days after the onset of the illness is a necessary part of the campaign against the disease. The object is to prevent the acquiring and spreading of infection by the mosquitoes. In the protection of healthy people from *Aedes aegypti*, house screens and bed nets are comparatively unsatisfactory, because this mosquito is difficult to exclude, and, as has been stated above, bites freely in the daytime. Repellents are of little use. In the control of the disease they are dangerous, allowing people to go to sleep, but exposing them to uninterrupted biting later. Citronella is one of the most powerful repellents available. Applied thoroughly to the skin, it will prevent biting for an hour or a little more and discourage attack for two hours or so; but mosquitoes will bite on an untreated patch of skin on a

treated arm. Claims occasionally made—that this or that mixture sprinkled on a towel at the head of the bed will give protection all night—are over-optimistic.

Summary of Control Measures.—(i) The aim should be eradication. (ii) All rain-water tanks should be screened effectively or oiled thoroughly. (iii) All other water in containers about the house should be cleared away. (iv) Adult mosquitoes should be killed with fly spray. (v) Dengue fever patients should be nursed under nets.

ACKNOWLEDGEMENTS.

We desire to thank the Director-General of Medical Services, Allied Land Forces Headquarters, for permission to publish this article, and our thanks are also due to the Deputy Director of Medical Services, New South Wales Lines of Communication Area, for the provision of opportunities for recent studies of the disease.

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ACTIVE IMMUNIZATION BY THE INTRANASAL ROUTE IN EXPERIMENTAL PERTUSSIS.

By E. A. NORTH and G. ANDERSON,
 From the Commonwealth Serum Laboratories,
 Parkville, Victoria.

THE intranasal route of infecting mice with *Hemophilus pertussis* was suggested by Burnet and Timmins⁽¹⁾ as a means of assaying pertussis antigens administered intraperitoneally. The value of this method has been confirmed by North, Anderson and Graydon.⁽²⁾

Dow⁽³⁾ has recently reported on the use of the intranasal route for immunizing as well as infecting the mice in the assaying of pertussis antigens. She made no reference in her paper to the degree of immunity obtained by this method as compared with that which followed subcutaneous or intraperitoneal immunization. On the grounds, however, of the encouraging results obtained in mice, she suggested that this method of immunization might be used on human beings.

Unrecorded experiments in mice made during the course of a previous investigation⁽⁴⁾ showed that intranasal administration of pertussis vaccine conferred a much higher order of immunity than did the intraperitoneal or subcutaneous injection of the same antigen.

The work reported in this paper was in progress when Dow's⁽³⁾ article was published. Evidence is presented here to show the advantage of intranasal as compared with intraperitoneal immunization of mice, and also to show that the enhanced immunity is not entirely specific.

Methods.

Immunizing Agents Used.

Vaccines.—Preliminary experiments failed to show any difference in immunizing power between Phase I pertussis vaccines which were heat killed and those to which different antisepsics were added, when the vaccines were given intranasally. The various organisms were grown on the appropriate solid medium for twenty-four or forty-eight hours, suspended in saline solution and heated to 56° C. for thirty minutes. When not in use they were stored in the cold room.

Living Organisms.—With living organisms, part of the saline suspension prepared for the vaccine was removed prior to heating and administered immediately.

Silica Suspension.—Silica sand was ground in a mortar for half an hour and suspended in saline solution to the same opacity as the vaccines used in the same experiment.

Intranasal Administration of Immunizing Agents.

Immunizing agents were given intranasally in the same way as the infecting *Hemophilus pertussis* suspensions, 0.05 cubic centimetre being instilled into the nostrils of the mice under light chloroform and ether anaesthesia.

Passive Immunity Tests.

The method for passive immunity tests which has been previously described⁽⁵⁾⁽⁶⁾ involves the administration to mice of 0.25 cubic centimetre of serum by the intraperitoneal route, followed in few hours by a test dose of living Phase I *Hemophilus pertussis* intranasally.

Criteria of Immunity.

The criteria of immunity have been previously described;⁽²⁾ briefly, they consist of (a) reduction in mortality or delay in deaths of mice intranasally infected with a large (or lethal) dose of living *Hemophilus pertussis*; (b) prevention of lung infection in mice given intranasally a small (or non-lethal) dose of living *Hemophilus pertussis*. The results of experiments have been evaluated statistically.

Results.

Comparison of the Immunity following Intranasal and Intraperitoneal Administration of Vaccine.

Protection against death following a large infecting dose of *Hemophilus pertussis* has been shown in mice immunized by the intraperitoneal route.⁽³⁾ Mice immunized intranasally with corresponding or even smaller amounts of vaccine have repeatedly been found to possess a higher grade of immunity.

It was, however, in experiments in which the infecting dose proved overwhelming for the intraperitoneally immunized as well as for the untreated mice, that the higher order of protection in animals immunized by the nasal route was most obvious. The results of one of many such experiments carried out are shown in Table I. It will be seen that there is a statistically significant difference in favour of the mice immunized intranasally (Groups A and B) over mice immunized intraperitoneally (Groups C and D), which have fared little better than the untreated controls (Group E). The additional advantage of multiple intranasal injections is clear (Group A v. Group B, $P = 0.00043$) in contrast to intraperitoneally injected mice, in which the undoubted value of multiple injections has not been proved.⁽²⁾

The duration of the immunity following intranasal immunization was investigated. Two hundred mice were divided into ten groups of twenty each. Five of these groups were given a single intranasal injection of vaccine (50,000,000 organisms), whilst the remaining groups were

¹ P = probability factor.

TABLE I.

¹ Mice in Groups A and C received their first injection of vaccine (100,000,000 cells) on the day that Groups B and D were immunized, and a second injection seven days later. All mice were infected intranasally with 50,000,000 *Haemophilus pertussis* organisms after a further seven days. Mice were observed for two weeks after infection, at the end of which all survivors were perfectly healthy.

* P = probability factor. When $P = 0.01$, the odds are one in 100 that the result obtained is due to chance. Values of 0.05 or less are regarded as statistically significant, and values of 0.005 or less as highly significant.

untreated. One group of treated and one of untreated mice were infected on the tenth day after vaccination, and other groups were infected at intervals of a week up to the thirty-eighth day with a lethal dose of *Haemophilus pertussis*. The treated mice tested on the tenth day showed no protection against death, whilst those infected on the seventeenth, twenty-fourth and thirty-first days all showed a statistically significant protection, and those infected on the thirty-eighth day showed a highly significant protection compared with the untreated controls ($P = 0.000073$).

This high grade of protection, extending at least into the sixth week after intranasal administration of vaccine, compares favourably with that following intraperitoneal inoculation, in which the immunity has been found to fall off about four weeks after injection.¹⁰

Nature of the Immunity following Immunization by the Intranasal Route.

The factor of general immunity was first investigated, an attempt being made to determine the amount of protective antibody in the serum of intranasally immunized mice compared with that in the serum of intraperitoneally immunized animals. One hundred and fifty mice were divided into three equal groups. One group (A) was immunized intranasally and another (B) intraperitoneally with a single injection of Phase I pertussis vaccine. The third group (C) was not treated, and served as a control. Three weeks later fifteen mice from each group were used to compare their active immunity. The remainder were bled out and the pooled serum of each group was used for passive protection tests.

A brief outline of the active immunity test is shown in Table II. It will be noticed that, as is usual in such experiments, there is a significantly greater amount of immunity in the intranasally immunized group (A) than in the intraperitoneally immunized group (B).

TABLE II.
Comparison of Active "Total" Immunity in Groups of Mice¹ whose General Immunity is Compared in Table III.

Group.	Route of Immunization.	Number of Survivors.	Statistical Significance.
A	Intranasal.	15/15	{ v. "B" $P^2 = 0.0084$ v. "C" $P = 0.0000053$
B	Intraperitoneal.	9/15	v. "C" $P = 0.030$
C	Untreated controls.	3/15	

¹ All mice were infected intranasally with 25,000,000 *Haemophilus pertussis* organisms one month after injection of vaccine, and survivors were discarded after a further twenty-eight days.

* P = probability factor.

The experiments for passive protection were carried out as previously described.⁽¹⁰⁾ Tested against large infecting doses of *Haemophilus pertussis*, an equal and significant amount of protection was afforded by serum from the intranasally and intraperitoneally immunized mice. The two types of serum were also tested by the small infecting dose technique. The data of an experiment in which this technique was used are shown in Table III. It will be seen that the serum from the intranasally immunized mice (Group A) did not give quite such good protection as that from intraperitoneally immunized mice (Group B). The difference, however, is not significant, and it would seem that mice immunized by either route develop an approximately equal degree of general immunity.

Specificity or Non-Specificity of Local Immunity in Lungs.

The experiments recorded above indicate that a considerable degree of local as distinct from general

TABLE III.

Protective Action of Pooled Serum of (a) Intranasally and (b) Intraperitoneally Immunized Mice Given by the Small Infecting Dose Technique.¹

³ All mice were given 0.25 cubic centimetre of serum intraperitoneally and three hours later a small infecting dose of *Hemophilus pertussis* intranasally. The mice were killed and lungs were cultured seven days later.

¹The notations indicate the amount of growth of *Haemophilus pertussis* on Bordet-Gengou plates after cut mouse lung had been rubbed over the surface: + + + + = confluent growth, + + + = semi-confluent, + + = many discrete colonies, + = occasional colony, O = sterile plate, and C = contaminated plate, result discarded.

* P = probability factor.

immunity follows the intranasal administration of Phase I pertussis vaccine. The specificity or otherwise of this local immunity was studied.

Immunity to subsequent intranasal infection with Phase I *Hemophilus pertussis* has been found to follow the introduction of suspensions of some living organisms, other than *Hemophilus pertussis*, while infection with others has had no effect. An abbreviated protocol (Table IV) shows the results of four such separate experiments.

TABLE IV.
Immunity to Infection with *Hemophilus pertussis* following Recovery from Intranasal Infection with Various Organisms.

Group.	Infecting Organism Recovered from	Days after Immunity to <i>Hemophilus pertussis</i> was Tested.	Number of Survivors after Intranasal Pertussis Infection.	Statistical Significance of Number of Survivors Compared with Other Specified Groups.
A	<i>Bacillus parapertussis</i> . Nil.	19	20/20	v. "B" $P = 0.0000017$
B		Controls Group A.	6/20	
C	<i>Hemophilus influenzae</i> . Nil.	16	7/8	v. "D" $P = 0.00025$
D		Controls Group C.	0/10	
E	<i>Streptococcus pneumoniae</i> . Nil.	21	0/6	
F		Controls Group E.	0/10	
G	<i>Influenza virus</i> . Nil.	16	0/9	
H		Controls Group G.	0/8	

¹ P = probability factor.

Killed vaccines prepared from many different organisms have also been administered intranasally to mice, and their effect has been compared with that of Phase I pertussis vaccines. Amongst vaccines so tested were those prepared from Phase III *Hemophilus pertussis*, *Bacillus parapertussis*, *Hemophilus influenzae* (several strains), *Brucella bronchiseptica*, *Streptococcus pneumoniae*, *Staphylococcus pyogenes* and *Bacterium coli*. The effect of suspensions of finely ground silica was also tried on several occasions. The results of one representative experiment are shown in Table V.

TABLE V.
Immunity following the Intranasal Administration to Mice of Various Killed Bacterial Suspensions and a Silica Suspension.¹

Group.	Immunizing Suspension.	Number of Survivors 28 Days after Subsequent Infection with <i>Hemophilus pertussis</i> .	Day of Death.	Statistical Significance of Number of Survivors Compared with Controls.
A	Phase I <i>Hemophilus pertussis</i> .	10/10		$P = 0.0000054$
B	<i>Bacterium coli</i> .	7/7		$P = 0.000051$
C	<i>Brucella bronchiseptica</i> .	7/9	6, 9	$P = 0.00073$
D	<i>Hemophilus influenzae</i> .	3/5	5, 8, 13, 18, 22	$P = 0.069$
E	<i>Streptococcus pneumoniae</i> .	0/6	2, 2, 2, 2, 2, 2	
F	Silica.	2/7	2, 2, 5, 5, 6	$P = 0.156$
G	Controls (Nil).	0/10	2, 2, 2, 2, 2, 3, 3, 3	

¹ All mice given 50,000,000 Phase I *Hemophilus pertussis* organisms intranasally sixteen days after Groups A to F received the suspensions shown in column 2. The opacity of all suspensions was approximately the same ($= 5 \times 10^6$ Phase I *Hemophilus pertussis* organisms).

² P = probability factor.

³ Not statistically significant, but would be so if delay in death were considered. Other experiments have given significant results as regards survivors.

In general, it may be stated that vaccines prepared from organisms with antigenic relationship to Phase I *Hemophilus pertussis* afforded some immunity. The protection was, however, always less than that following the intranasal injection of Phase I *Hemophilus pertussis*

vaccine. Staphylococcal and pneumococcal vaccines produced no demonstrable effect, but one prepared from *Bacterium coli* gave an unexpectedly good immunity (see Table V). It was noticed, however, that although the end result was as good as that following Phase I pertussis vaccine, the mice (Group B) were very ill for some days following infection with pertussis. The results of many experiments suggested that silica produced a slight immunity.

Sections were prepared from lungs of mice treated with the various bacterial suspensions, both living and killed, and from some that were given silica. The histological appearances of the lungs of mice belonging to groups that proved resistant to subsequent infection with *Hemophilus pertussis* infection were similar. In all there was a thickening of the interstitial tissue of the lung. This thickening, due to infiltration mainly of small round cells, varied in extent, and was most pronounced in the lungs of mice that received *Hemophilus pertussis* suspensions intranasally. *Bacterium coli* produced a particularly well marked infiltration. Little or no change could be detected in the lungs of mice following the administration of staphylococcal vaccine. The changes following the introduction of pneumococcal vaccine were those of bronchopneumonia.

Discussion.

Our results clearly show that intranasally immunized mice develop a higher grade of immunity against a subsequent intranasal infection with *Hemophilus pertussis* than do mice immunized with the same antigen by the intraperitoneal or subcutaneous routes. The possibilities are that this added immunity is the result of (a) increased general immunity, or (b) a local immunity, or (c) a combination of both.

Dow⁽¹⁾ found that the serum from intranasally immunized rabbits contained at least as much protective antibody as serum from rabbits immunized by the intravenous route. However, as the order of protection to mice afforded by these types of serum was low, she was cautious in her conclusions. However, her results are in accord with our failure to find a significant difference in the protective power of serum from intranasally and intraperitoneally immunized mice. The method adopted by us, as shown previously,^(2,3) allows comparatively small differences in protective power to be demonstrated. We therefore believe that intranasal immunization affords mice a general immunity about equal in degree to that following intraperitoneal immunization, in addition to a local immunity in the respiratory tract itself.

Both specific and non-specific factors are thought to play a part in local immunity. The findings of Cannon and Sullivan⁽⁴⁾ and of Walsh, Sullivan and Cannon⁽⁵⁾ indicate that specific antibody tends to be present in somewhat larger amounts in areas which have been brought into contact with the bacteria—in their case *Bacterium paratyphosum* B. Topley and Wilson,⁽⁶⁾ speaking of local immunity, consider that "all the evidence suggests that non-specific factors are of primary importance in those instances of local immunity that have been submitted to experimental study".

Bradford⁽⁷⁾ found that the type of lung lesion following the introduction of living *Hemophilus pertussis* into the respiratory tract of mice was non-specific, infection with *Hemophilus influenzae*, *Brucella bronchiseptica* and *Bacillus parapertussis* resulting in similar histological appearances. He also noted residual interstitial changes present three weeks after infection. This is of interest in conjunction with our histological finding that a similar interstitial infiltration follows the intranasal instillation of vaccines prepared from these four organisms, whilst it could not be found after the introduction of killed suspensions of staphylococcus or of *Streptococcus pneumoniae*. It is highly suggestive that the vaccines which produce this interstitial mononuclear infiltration protect mice against pertussis, whilst those that do not stimulate a similar cellular response are ineffective.

Dow⁽¹⁾ considers that pertussis vaccines can be compared as to antigenic power by administering them intranasally

to mice and subsequently infecting the mice by the same route with *Haemophilus pertussis*. Using this method, she found no difference in immunizing power in vaccines which differed, amongst other things, in respect to turbidity, nitrogen content and preservative used! In view of the important rôle that non-specific local immunity plays in intranasal immunization in mice, it would appear safer to use a method of assay⁽¹⁾ in which the factor of local immunity plays no part. The nature of the preservative and the temperature of storage, among other things, have been shown by this method to affect the antigenic efficiency of a vaccine. Using the intranasal route for immunizing mice we, like Dow,⁽²⁾ were unable to detect such a difference.

The possibility of successfully applying to human beings intranasal immunization against pertussis naturally presents itself. The nasal route has already been used with some success for immunization against diphtheria and tetanus. This introduction of toxoid, however, is not without danger of immediate allergic symptoms and chronic nasal rhinitis.⁽³⁾

The introduction of pertussis antigen into the nose would not appear to present such dangers, but they must be borne in mind. Dow,⁽²⁾ who has tried it in a few cases, states that the method is easy and gives rise to no reaction. The comparatively high grade of immunity produced in mice suggests the possibility of an enhanced immunity in children. Further, as the method is not likely to be followed by severe reactions, one of the objections to mass immunization in Australia⁽⁴⁾ might be overcome.

Summary and Conclusions.

1. Intranasal immunization of mice with pertussis vaccine produces a higher grade of immunity than does immunization by the intraperitoneal or subcutaneous route.

2. This immunity is composed of (i) a general specific immunity due to circulating antibodies, and (ii) a local immunity in the respiratory tract, in which non-specific factors play a large part.

3. A trial of intranasal immunization in human beings is justified.

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THE THIAMIN (VITAMIN B₁) CONTENT OF SOME AUSTRALIAN BISCUITS AND BREAKFAST FOODS.

By E. C. SLATER and JOAN RIAL,
From the Australian Institute of Anatomy,
Canberra.

BISCUITS, cakes and cereals (mainly breakfast foods) provide a considerable proportion of the carbohydrate in the average Australian diet. Table I, which was compiled from the data in the Final Report of the Advisory Council on Nutrition (1938), shows the relative importance of these classes of foodstuffs in the average New South Wales

TABLE I.
Contribution of Cereals, Cakes, Biscuits, Flour to the Australian Diet.

Class of Foodstuff.	Percentage of			
	Total Calories.	Total Carbohydrates.	Total Protein.	Total Fat.
Cakes, biscuits <i>et cetera</i> ...	4.6	5.1	2.2	4.6
Cereals ...	4.3	6.9	3.4	0.8

As thiamin is required for the combustion of carbohydrate, it is important to know the thiamin content of foodstuffs rich in carbohydrate. With the exception of a few determinations previously reported from this laboratory (Clements *et alii*, 1941), there is no published information on the thiamin content of biscuits or pre-cooked breakfast foods. Nevertheless, many manufacturers of these foodstuffs make extravagant claims concerning the thiamin content of their product.

EXPERIMENTAL INVESTIGATION.

The biscuits and breakfast foods studied were all purchased on the open market in the capital cities of all the States. One packet only was purchased and the whole was ground finely. No attempt was made to determine the variation in the thiamin content from packet to packet of the same brand. Consequently the result given for any particular brand cannot be accepted too rigorously; but sufficient determinations were made on each group of biscuits to enable a valid comparison of one group with another. In the case of many of the common types of biscuit made by several manufacturers (for example, milk coffee biscuits), a number of different makes were purchased from several States. Each of these was ground and equal quantities of the ground material were mixed. The thiamin content was determined on the mixed sample. Owing to their special interest, the thiamin content of each brand of wheatmeal biscuit was determined separately.

Method of Determination of Thiamin Content.

Biscuits and pre-cooked breakfast foods contain pigment and fluorescent substances which are not completely removed from the isobutanol solution of the thiocchrome by the method of Wang and Harris (1939). The presence of these substances makes accurate matching by the visual technique of Wang and Harris very difficult, although rough values can be obtained by this method.

The determinations described in this paper were made by measuring the fluorescence with the Klett photoelectric fluorimeter. This fluorimeter has been described by Kavanagh (1941). The non-specific fluorescence in the isobutanol solution was eliminated as much as possible by a Wratten filter 47, which transmits the maximum fluorescence of thiocchrome (460 μ to 470 μ) and absorbs the non-specific fluorescence. Scattered ultra-violet light was absorbed by a Corning 028 glass filter. With these two filters in position, a low and easily reproducible reagent

blank was obtained. The standard was a solution of 0.5 milligramme of quinine sulphate in 1 litre of 0.1N sulphuric acid. It was necessary to change this solution frequently during the course of a series of readings. The ultra-violet light passed through Corning 597 filters before striking the cuvette. A Corning 028 filter was placed between the cuvette containing the standard solution and the photoelectric cell.

Thiochrome is rapidly destroyed by ultra-violet light in this instrument. Kavanagh found that pure thiochrome dissolved in isobutanol was half destroyed in about ten minutes. We have observed a greater rate of destruction; one-half of the thiochrome was destroyed in about five minutes. Accordingly, it was necessary to take a series of fluorimeter readings over one minute. A stop-watch was set going when the cuvette containing the thiochrome was placed in the ultra-violet beam, and readings were taken at intervals of about ten seconds for one minute. The readings (corrected for the blank) were plotted against time on semi-log paper and extrapolated back to zero time. The substance responsible for the blank fluorescence was also destroyed, although more slowly, by ultra-violet light, and the same procedure was adopted. The corrected fluorimeter readings were proportional to the concentration of thiochrome over the range of concentrations used in this investigation.

The method of extraction of the thiamin from the samples was the same as that previously described (Slater, 1941)—namely, extraction overnight at 37° C. with takadiastase at pH 3.8. A definite volume of extracting liquid was added and it was assumed that the incubation did not alter the volume of aqueous phase. Under the conditions of extraction, very little of the solid matter is actually dissolved. The volume of aqueous phase would be slightly increased by the water in the sample; but this causes an error of only a few *per centum* and has been neglected. This error may be accurately evaluated and a correction factor applied by the addition of a known amount of thiamin before incubation (see Booth, 1940).

The fluorescence caused by a unit concentration of thiochrome is not so high when the isobutanol solution of the thiochrome is prepared from a biscuit or pre-cooked breakfast food extract as when it is prepared from a pure aqueous solution of thiamin. This is due to substances in the final isobutanol solution, which absorb either some of the activating ultra-violet light or some of the fluorescent blue light. For this reason the fluorescence in the isobutanol solution is compared with that in a similar solution prepared in exactly the same way from a portion of the same extract containing added thiamin.

Use of Methanol.

Methanol is used in the Wang-Harris thiochrome method in order to protect the thiochrome from the destructive effects of excess of potassium ferricyanide. For this reason methanol was used in all the determinations described in the present paper. It has since been found, however, that the omission of methanol in the case of many pre-cooked breakfast foods (but not in the case of biscuits) gave isobutanol solutions with a lower blank and showing a greater fluorescence for the same concentration of thiochrome. With these extracts methanol produced a copious white precipitate, which dissolved when shaken with isobutanol, and it was observed that the ethanol used to clarify the final isobutanol solutions actually caused a cloudiness. This was not observed when methanol was omitted. The cloudiness scattered incident ultra-violet light and tended to reduce the fluorescence. For this reason, it would be preferable to omit the use of methanol in the determination of the thiamin content of pre-cooked breakfast foods, although quite reliable results are obtained when it is used. Recently McFarlane and Chapman (1941) have doubted the protective effect of methanol on thiochrome.

The Blank Correction.

The usual procedure when the thiochrome technique is followed is to subtract the blank from the "oxidized" reading. The assumption is made that the fluorescence of

the blank is unchanged on oxidation. This is not quite true in the case of blanks prepared from urine. Jowett (1940) showed that during the oxidation of thiamin to thiochrome, half of the urine blank fluorescence is destroyed.

In the case of white flour, wheat *et cetera*, the blank correction is so low that the error involved is small if the blank was destroyed on oxidation. But pre-cooked breakfast foods gave very large blanks, and it was necessary to investigate how the blank behaved with alkaline ferricyanide. This was investigated in several ways.

1. The thiochrome was destroyed completely by irradiation of the isobutanol solution with ultra-violet light for thirty to forty-five minutes. In this time one-third of the blank was also destroyed. The final isobutanol solution, after thirty to forty-five minutes' irradiation, gave the same reading in the fluorimeter as the blank at the same time. This showed that the portion of the blank which was not destroyed by thirty to forty-five minutes' irradiation with ultra-violet light (about two-thirds of the total blank) was unchanged on oxidation, but gave no information as to the fate of the remaining one-third.

2. The rate of destruction of the fluorescence from an "oxidized" isobutanol solution was studied. Different curves were plotted relating the fluorescence due to the thiochrome with time, on the assumption (a) that there was no destruction of the blank on oxidation, (b) that there was destruction of one-third of the blank, and (c) that there was destruction of all of the blank. Curve (a) was a straight line, while curves (b) and (c) deviated considerably from a linear function.

3. Several low values were obtained for the thiamin content of "ready to eat" breakfast foods, if the calculation assumed no destruction of the blank. In these cases nearly all the fluorescence of the "oxidized" solution was contributed by the blank. But in no case was a negative answer obtained, as would be expected if a large part of the blank was destroyed on oxidation.

4. The thiamin was removed from the extract of the biscuit or breakfast food by treatment with sodium sulphite, according to the conditions used by Schultz, Atkin, Frey and Williams (1941). In general this treatment did not alter the blank. The effect of alkaline potassium ferricyanide on the blank was followed in the absence of the thiamin. In no case studied was the blank decreased by the oxidation. In a few cases there was a slight increase, but this was sufficiently small to be neglected.

These experiments convinced us that the blank correction was valid in the case of biscuits and breakfast foods.

Reproducibility of the Method.

It was calculated statistically from the duplicate determinations on all the biscuits and breakfast foods investigated that the standard error of an individual result obtained according to the procedure described below was 4.7% of the mean if the sample contained more than 0.5 μ per gramme. The percentage error was a little greater if the sample contained less than 0.5 μ per gramme.

Procedure.

The procedure was as follows:

A weighted amount of sample (20 grammes if the sample contained less than 3.0 μ per gramme, 10 grammes for samples containing 3.0 μ to 6.0 μ per gramme and 5.0 grammes if the sample contained more than 6.0 μ per gramme) was incubated overnight at 37° C. with 0.1 gramme of takadiastase in 100 millilitres of buffer solution of pH 3.8. The mixture was shaken vigorously and centrifuged. Ten millilitres of the clear extract were shaken with an equal volume of isobutanol and two blanks and two "oxidized" samples were prepared according to the method of Wang and Harris (1939) from two millilitre aliquots of the water layer. Fifteen millilitres of isobutanol were used to extract the thiochrome and two millilitres of ethyl alcohol were used to clarify the solution. The separate control test of Wang and Harris was omitted and 0.2 millilitre of 5% potassium ferricyanide solution was used for the oxidation. The blanks were prepared in the same way as the "oxidized" samples, except that 0.2 millilitre of water was used instead of the potassium ferricyanide solution.

To another portion of 25 millilitres of the takadiastase extract of the sample, one millilitre of thiamin solution containing 15 μ per millilitre of 0.1N hydrochloric acid was added and mixed. A portion was shaken with an equal volume of isobutanol and two "oxidized" samples were prepared on 2.0 millilitres of the water layer in exactly the same way as that described above. Readings obtained for these solutions were multiplied by 1.04 in order to allow for the dilution before subtraction of the blank.

The isobutanol solutions should be kept in the dark until the measurement of the fluorescence is made. It was found that three hours' exposure to the ordinary light of the laboratory near a window (but not in direct sunlight) destroyed 32% of the thiochrome. There was no destruction (less than 0.5%) after four hours in semi-darkness.

Results of the Determinations.

The results of the determinations of the thiamin content of the breakfast foods and cereals are given in Tables II and III. The biscuits have been classified into groups, according to the classification in the Fifth Report of the Advisory Council on Nutrition (1938). The breakfast foods are divided into two main groups. Group I includes ten of the most popular brands of "ready to eat" breakfast foods. Group II comprises those breakfast foods which have been

TABLE II.
Thiamin Content of Biscuits.

Type of Biscuit.	State in which Purchased.	Thiamin Content. (Microgrammes per Gramme.)
<i>Group I: Dry or Unsweetened Biscuits (Cracker or Puff Type)</i>		
1	Combined four brands from four States.	0.90
2	South Australia.	0.86
3	Western Australia.	0.74
4	Queensland.	1.19
5	Victoria.	1.24
6	South Australia.	1.46
7	Victoria.	1.23
8	New South Wales.	1.35
9	Tasmania.	1.04
10 (Cheese)	Western Australia.	0.98
11 (Cheese)	Queensland.	0.86
12 (Cheese)	New South Wales.	1.11
13 (Cheese)	Victoria.	0.83
<i>Group II: Sweet Biscuits with Jam or Other Filling in the Form of a Sandwich.</i>		
14	New South Wales.	0.46
<i>Group III: Sweet Biscuits.</i>		
15	Combined nine brands from six States.	0.55
16	Combined nine brands from six States.	0.65
17	Combined nine brands from six States.	0.63
18	Combined nine brands from six States.	0.33
19	Tasmania.	0.38
<i>Group IV: Biscuits Containing a Proportion of Whole Grain.</i>		
20	Western Australia.	3.64
21	Western Australia.	1.72
22	Queensland.	1.07
23	Queensland.	2.18
24	Tasmania.	2.18
25	New South Wales.	0.71
26	Victoria.	2.24
27	Queensland.	2.03
28	New South Wales.	1.28
29	South Australia.	2.01
30	South Australia.	0.66
31	South Australia.	0.94
32	Victoria.	1.57
<i>Group V: Rusks.</i>		
33	Queensland.	1.00
34	Victoria.	0.79
35	South Australia.	0.86
36	New South Wales.	0.67

TABLE III.
Thiamin Content of Breakfast Foods.

Number.	Description.	Thiamin Content. (Microgrammes per Gramme.)
<i>Group I: Ready to Eat.</i>		
1	"Bubbles."	0.22
2	Flakes.	0.12
3	Flakes.	0.11
4	Flakes.	0.28
5	"Puffed."	0.40
6	Biscuit.	0.90
7	Biscuit.	0.55
8	Biscuit.	0.40
9	Biscuit.	0.19
10	Bran product.	3.9
11	Made from malted barley and whole wheat.	3.1
<i>Group II: Not Pre-cooked, or Only Partially Pre-cooked during Manufacture.</i>		
12	Rolled oats.	5.2
13	Rolled oats.	5.0
14	Groats.	6.1
15	Partially pre-cooked oatmeal.	1.32
16	Wheatmeal.	4.3
17	Wheat product.	4.2
18	Wheat and wheat germ product.	7.9
19	Partially pre-cooked wheatmeal.	3.6
20	Partially pre-cooked wheatmeal.	2.4
21	Partially pre-cooked wheatmeal.	2.4
22	Wheat product.	1.4

either uncooked or only partially pre-cooked during manufacture. These are made into various forms of porridge before being eaten. These tables are summarized in Table IV, which also includes the thiamin:non-fat Calorie ratio of each group. The non-fat Calories were calculated from the tables in the Fifth Report of the Advisory Council on Nutrition. Williams and Spies (1938) have shown that the thiamin:non-fat Calorie ratio gives the best index of the thiamin value of a food. Table IV also gives figures for Australian whole wheat and white bread for comparison. These figures have been taken from the Report of the Nutrition Committee of the National Health and Medical Research Council (1941).

TABLE IV.

Foodstuff.	Thiamin Content. (Microgrammes per Gramme.)		Mean Thiamin per Non-Fat Calories
	Range.	Mean.	
Dry biscuits (Group I)	0.74-1.46	1.06	0.34
Sweet biscuits (Groups II and III)	0.33-0.65	0.50	0.16
Wheatmeal biscuits (Group IV)	0.66-3.64	1.64	0.53
Rusks (Group V)	0.67-1.0	0.83	0.23
Ready to eat breakfast foods:			
(i) Excluding 10 and 11	0.11-0.90	0.35	0.11
(ii) 10 and 11	3.1-3.9	3.5	1.06
Rolled oats and groats	5.2-6.1	5.7	1.81
Whole wheat grain	—	5.1	1.54
White bread	—	0.88	0.34

Destruction of Thiamin During the Cooking of Porridge.

It was found that forty-five minutes' boiling on an electric hot plate destroyed less than 5% of the thiamin in rolled oats.

Thiamin:Non-Fat Calorie Ratio of Servings of Breakfast Food.

Breakfast foods are usually eaten with sugar and milk. Sugar provides non-fat Calories, while milk provides both thiamin and non-fat Calories. Table V shows the

TABLE V.
Plate of Porridge (Half a Pound of Porridge).

Food.	Weight. (Grammes.)	Thiamin. (Micro- grammes.)	Non-Fat Calories.	Thiamin per Non-Fat Calories.
Oatmeal	29	165	97	1.8
Milk	85	32	30	1.1
Sugar	26	0	106	0
		197	233	0.85

thiamin:non-fat Calorie ratio of a plate of oatmeal porridge served with milk and sugar and Table VI gives this ratio for a serving of "ready to eat" breakfast food.

TABLE VI.
Plate of Ready to Eat Breakfast Food.

Food.	Weight. (Grammes.)	Thiamin. (Micro- grammes.)	Non-Fat Calories.	Thiamin per Non-Fat Calories.
Cereal	33	12	118	0.10
Milk	126	48	44	1.1
Sugar	12	0	49	0
		60	211	0.28

The figure taken for the thiamin content of the milk was the mean of 13 determinations (by the visual method) on retail cow's milk bought in Canberra at intervals of about one month for one year. These samples contained from 29 to 47 microgrammes per 100 millilitres of thiamin, with a mean of 38 microgrammes per 100 millilitres. There was no significant seasonal variation during the year.

DISCUSSION.

There is a wide variation in the thiamin content of biscuits. As would be expected, the various wheatmeal biscuits, as a class, contain the most thiamin. But the average thiamin content of this group is only one-third that of whole wheat, and it is clear that a large proportion of the thiamin is destroyed during manufacture. The average of this group has a thiamin:non-fat Calorie ratio about 50% above that for average Australian white bread, but for many brands the ratio is less than that of white bread. At least one of these is advertised as containing the full thiamin content of whole wheat. It was observed that in general the dark brown biscuits contained less thiamin than the light brown ones. Dry biscuits contain on an average the same thiamin:non-fat Calorie ratio as white bread, but sweet biscuits and rusks contain very much less. The comparatively low thiamin content of biscuits is not surprising when one considers the high temperatures to which they are subjected during manufacture. In many cases sodium bicarbonate is used, and this would increase the destruction.

For the same reason pre-cooked breakfast foods (with two exceptions) are an extremely poor source of this vitamin. Many of the most popular of these foods contain practically no thiamin at all. These, too, include products for which the claim is made by the manufacturers that they contain all the nutrient of the whole grain.

On the other hand, oatmeal is a rich source of thiamin and (partly owing to a higher fat content) possesses a higher thiamin:non-fat Calorie ratio than whole wheat. No figures are available for the thiamin content of Australian oats. Schultz, Atkin and Frey (1941) found that 21 samples of American oats contained from 4.8 μ to 10.8 μ of thiamin per gramme. The mean was 7.2 μ per gramme. The figures obtained by us for rolled oats and groats (which has the pericarp removed) suggest that if there is a loss of thiamin during the manufacture of these foods, it is certainly not very great. Ordinary methods of household cooking of porridge destroy very little of this vitamin.

Several wheat and oatmeal products are marketed in a partially pre-cooked form. This pre-cooking considerably reduces the time required for cooking the porridge in the home and at the same time stabilizes the fat against rancidity. However, this treatment appears to destroy a considerable amount of the vitamin, and the thiamin content of this group of food lies between that of rolled oats and the "ready to eat" breakfast foods. In these cases, too, the manufacturers often claim that the whole vitamin content is retained.

The wheatmeal porridge, when not pre-cooked, contained a little less thiamin than rolled oats, but the figures obtained were within the range of variation of the thiamin content of Australian wheat. Number 18 contained an especially high concentration of thiamin, apparently owing to its abnormally high germ content.

Tables V and VI, besides illustrating the difference in thiamin value of a dish of porridge and one of "ready to eat" breakfast food (of about the same calorific value), demonstrate the important effect that sugar has in reducing the thiamin:non-fat Calorie ratio of a dish of food.

SUMMARY.

1. Biscuits, cakes, cereals *et cetera* (bread excluded) together provide 8.9% of the total Calories in the average New South Wales diet, 12% of the carbohydrate, 5.6% of the protein and 5.4% of the fat.

2. A method is described for the determination of thiamin in biscuits and breakfast foods by means of a photoelectric fluorimeter. It was found that the "blank" was not destroyed on oxidation.

3. Figures are given for the thiamin content of 36 biscuits and 22 breakfast foods.

4. A large proportion of the thiamin is destroyed during the manufacture of biscuits and "ready to eat" breakfast foods. Sweet biscuits and several of the most popular "ready to eat" breakfast foods contain very little thiamin.

5. Rolled oats is an excellent source of thiamin. Types of oats and wheat porridge which have been partially pre-cooked during manufacture are fair sources of thiamin.

6. There is very little destruction of thiamin during the household cooking of porridge.

7. Values are given for the thiamin content of plates of porridge and of oatmeal.

8. The mean of 13 determinations of the thiamin content of Australian cow's milk was 38 μ per 100 millilitres.

9. A large number of the foodstuffs examined in this investigation contained very much less thiamin than was indicated by the advertisements.

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MEDICAL CONDITIONS ON BATHURST AND MELVILLE ISLANDS.

By EDWARD FORD,

From the School of Public Health and Tropical Medicine, University of Sydney.

The Islands.

THE large islands of Bathurst and Melville lie between the eleventh and twelfth parallels of south latitude, directly to the north of Darwin, from which the closest part of Bathurst is distant some fifty miles. At the eastern extremity of Melville Island the mainland approaches to within about seventeen miles, where the Dundas Strait separates the westerly projecting Coburg Peninsula from the island.

Melville Island, the larger of the two, is about 75 miles long by 50 miles wide. Bathurst Island, pressed close to the western side of Melville Island, is about one-third of the size of the latter. They are separated by the narrow Apsley Strait, which for the greater part of the 45 miles of its length resembles a winding tidal river. Its heavily wooded, mangrove-lined shores close in places to 300 or 400 yards, while in others they widen to form lake-like stretches some two or three miles broad.

The islands are mainly flat, with occasional low ranges and rocky elevations. They are well watered, even in the dry season, by numerous creeks.

The country is covered by bush of varying density, which resembles that of the neighbouring mainland, and which includes gum trees of various types, stringybarks, ironwoods, woolly-butts and clumps of cypress pines. Interspersed with this are belts of dense jungle and areas of open grass country.

The fauna generally resembles that of the Northern Territory of Australia, though the kangaroo is not found. Native animals are plentiful, and provide an abundant food supply for the aboriginal inhabitants. Wallabies are particularly numerous, as are bandicoots, flying foxes and other small animals. On Melville Island the Indian buffaloes, descended from those imported by the settlers at Fort Dundas over a century ago, reached considerable numbers, though the herds are now reduced by years of shooting for the hides. Birds of various kinds, fish, shellfish, crocodiles, snakes, lizards and wild honey also form articles of the plentiful native diet, together with yams and other vegetable foods.

The climate approximates to that of the coastal belt of the Northern Territory, and is divided into two periods, a wet season from about December to March, when the greater part of the heavy rainfall occurs, and a dry season from about May to December. In the wet months there is a high relative humidity, though the maximum dry bulb temperature probably never rises much beyond the vicinity of 90° F. The prevailing wind in the wet season is the north-west monsoon, which is associated with sudden severe storms and rough weather. The days are cloudy and thunderstorms are frequent. About April the south-east trade winds set in, and the dry season commences. This season is marked by a succession of cloudless sunny days, with pleasantly cool nights, and for the most part the weather at this season is almost perfect.

The Native Inhabitants.

The aboriginal inhabitants are of the Australian race, and are remarkable for their fine physical development, as well as for their intelligence, in both of which they are far superior to the greater part of the mainland natives. For the most part they are tall, well proportioned and well nourished. And although they were long noted for their fierceness and intense hostility to intruders, they are humour-loving and adaptable.

Although the islands are not far distant from the northern centres of civilization and the people are thoroughly conversant with European customs, their tribal system has not been broken down by the contact, as no permanent white settlement has persisted on the islands.

The people of both Bathurst and Melville Islands speak the same language and share, for the most part, the same customs, though they are divided into a number of local groups. Their customs differ from those of the mainland tribes, noticeably in their complicated burial and mourning ceremonies, and in the elaborately fashioned and painted posts which are placed about their graves. Neither circumcision nor subincision is practised.

Asiatic Contacts.

Probably for centuries the islanders had contact with the Malays and Macassars, large fleets of whom regularly crossed the Arafura Sea on annual trading expeditions to the northern coasts. Their vessels sailed down with the north-west monsoons, and returned homewards some months later on the south-east trade winds.

Contemporary reports show that large numbers took part in these voyages. In 1802 Captain Matthew Flinders, during his survey of the northern coastline, made contact with Malay proas off Cape Wilberforce, on the coast of Arnhem Land. He was there advised that there were at that time sixty Malay ships on the coast, manned by about 1,000 men. And in 1829 Captain Bremer reported that the recently established settlement on Raffles Bay (on the Coburg Peninsula about seventy miles east of Melville Island) was visited in the months of March, April and May of that year by 34 Malay vessels, carrying 1,056 men.¹¹

Camps were established along the coasts and the neighbouring waters were fished for trepang and pearl shell, timber was cut, and a trade was carried on with the aborigines for turtle shell and beeswax. In many places the natives were employed by the visitors during their stay, and friendly relations apparently usually existed, though it is not known to what extent this was so at Bathurst and Melville Islands.

The long-established annual visits lapsed with the introduction by the Commonwealth of legislation restricting alien immigration. In 1904 it was insisted that the vessels, which had previously been inspected by South Australian officials at the Bowen Strait, should report at Darwin. This was rendered difficult for the sailing craft by the prevailing north-west monsoons, and the trade fell away.¹²

In spite of restrictive legislation, the islands have in late years been visited by Japanese pearl fishing vessels, and the fact is apparent, from a number of Japanese-aborigine half-caste children seen in the camps, that the forces which previously acted to prevent racial admixture in the case of the Malays and Macassars no longer apply. The oldest person of this admixture seen was about nine years old; this fact suggests that the change is a recent one.

European Contacts.

In 1824 the first white settlement in North Australia was formed on Melville Island by an expedition under Captain J. J. G. Bremer, who was sent from Sydney in His Majesty's ship *Tamar* with a party of soldiers and convicts to take possession of the islands and the neighbouring mainland coast, for the protection of trade and as a depot for ships passing through the Torres Straits to India and the East Indies. A site near the northern end of the Apsley Strait, named Fort Dundas, was occupied. The occupation lasted for five years, during which period the settlers suffered great misfortune and hardship. Constant friction occurred with the natives, who made frequent attacks on small parties. In one of these the medical officer of the settlement, Dr. John Gold, was fatally speared.

Isolation and food shortage resulted from the loss of the settlement's supply vessel *Lady Nelson*, which had been sent to Timor for stores. She was captured and burned by natives in the Sewatti Archipelago, and all her crew were killed. Soon afterwards the schooner *Stedcombe* was similarly dispatched, only to meet the same fate from native pirates near Timor Laut, all but two of her crew being slaughtered. Illness became rife among the settlers, who were now without a medical officer. It is probable that the illness was due to malaria, for it is recorded that they suffered from "ravages of fever and ague".

In 1829 Fort Dundas was abandoned and the personnel was removed to Raffles Bay, on the Coburg Peninsula of the neighbouring mainland. Today the crumbling ruins of a few of the more substantial buildings, overgrown trenches and earthworks, and the tide-washed stone jetty, mark the site of the venture.

For many years after the abandonment of Fort Dundas the islands had no permanent white residents, though towards the end of the century they were visited at intervals by buffalo shooters and timber cutters. In 1894 a buffalo hunter, R. J. Cooper, settled on Melville Island, where, after great difficulty, he established himself and finally gained great influence over the natives. They were still hostile to foreign intrusion, and Cooper was himself speared by them. He remained on the island until 1914.

In 1911 a settlement was formed on Bathurst Island for the Mission of the Sacred Heart by the Reverend Father Gaell, and the island was later made a native reserve under the protection of the mission fathers.

For many years natives of the islands have been employed about Darwin in domestic and other duties, and there is constant passage, by canoe and lugger, of parties to and from the mainland.

Medical Conditions.

In September and December, 1939, two visits were made to the islands, and among other duties, a total of 571 aborigines were medically examined. The conditions encountered among them form the basis for the following notes.

Physical Condition of the Natives.

Spencer, in 1911, regarded the physical condition of the islanders as the best he had seen among the aborigines of Australia.⁽¹⁾ This standard is still maintained, and of all the surviving Australian natives, only those who inhabit certain parts of Arnhem Land can compare with them physically.

For the most part the adults are sturdy and well nourished, and the infants are particularly robust and well tended.

An exception to this general appearance of fitness exists in children aged from about two to five years, in the dietary period intermediate between breast feeding and the proper assimilation of the unmodified adult diet which alone is available after weaning. It is in this period, also, that hookworm disease produces noticeable effects, the protuberant belly and anaemic appearance so commonly seen in children of this age having this added causative factor. It was stated by the Reverend Father McGrath, that among children at the Bathurst Island Mission the highest mortality rate occurs in this age period, and this probably holds also among the bush children. A similar state of affairs exists in eastern Papuan island communities, where conditions of infant diet are comparable. The older children, for whom the plentiful diet is more suitable, are stronger in appearance.

Respiratory Diseases.

Among the 571 persons examined, pulmonary tuberculosis was suspected in five cases, though in the sputum of none of the suspects were acid-fast organisms found.

In native communities, in which a low natural resistance to tuberculosis is common, the disease usually pursues a rapid course; generalized infection often occurs, and it is common for death to follow the onset closely. For this reason, even among tribes in whom the rate of infection is high, it is usual to find few persons showing the characteristic signs of the chronic disease usual in whites. For this reason, a single clinical examination of a community offers little evidence of the real state of affairs regarding the incidence of the disease.

Bronchopneumonia was diagnosed in the case of an emaciated old man, who suffered from neural leprosy, and who appeared to be *in extremis*.

Many sufferers from coryzal infections were seen, with cough and nasal discharge. Epidemics are said to occur most frequently in the dry season, and particularly towards its close. Nasal discharges, often profuse, are common in children.

Bronchitic signs were found in six persons.

Since there is a constant traffic with the mainland, especially of persons employed about Darwin, prevalent epidemic diseases are frequently introduced to the islands. Epidemics of influenza and whooping cough, occasionally associated with some mortality, have occurred from time to time.

Leprosy.

Two natives suffering from leprosy were discovered in the course of the visits, though this was not necessarily the total number involved. It is usual, among the bush people of North Australia, for suspected lepers to hide at the approach of a medical officer, for naturally enough, a widespread fear exists of the possibility of long or permanent removal from the tribe. The examination of natives, unless performed by a person who has lived in the neighbourhood for some time, and who has completely gained their confidence, may be expected to fail, for the reason mentioned, to locate every sufferer.

Cook, in his report published in 1927⁽²⁾ after an extensive survey, stated that as recently as 1914 a special survey of the Bathurst and Melville islanders had failed to discover any trace of leprosy among them; he considered that they had always been free from the disease. At that time leprosy in North Australia was confined to the Adelaide and Alligator River districts, to areas about the Roper, Daly and Goyder Rivers, and to some close-lying islands such as Goulburn and Crocodile Islands. The introduction of the disease to these parts was ascribed by Cook to Chinese immigrants, who were first brought into the Northern Territory in 1874. The disease was first discovered in tribes who were most closely associated with them. Cook anticipated the dissemination of leprosy to hitherto isolated and as yet unaffected natives, and his forecast has been gradually fulfilled.

Malaria.

No evidence of malaria, either active or latent, was found during the two visits. Of 218 children whose ages ranged from one to about twelve years, only two had palpable spleens; these were felt only at the costal margin at the end of inspiration. No splenomegaly was noted in 353 natives, aged over twelve years, who were also examined. In "thick drop" preparations from the two children with palpable spleens, as well as from twenty other persons, no malarial parasites were found.

No member of the staff of the Bathurst Island Mission, or of the Melville Island Police Post, at the northern end of the Apsley Strait, has of recent years suffered from malaria, though in both places there was an aggregation of natives about the stations.

Though there is no evidence that malaria at present exists on the islands, this has not always been the case. Over a century ago the personnel of the settlement at Fort Dundas, on Melville Island, suffered severely from what appears to have been malaria, and for centuries the islands had, as frequent visitors, vessels from highly malarious places to the northward. It is possible that the legislative action that led to a falling off in the numbers of these has acted to lessen the prevalence of the disease in the islands in recent years.

In 1911 an epidemic of subtropical malaria occurred on Melville Island, which was responsible for some thirty deaths among the native population;⁽³⁾ Holmes reported a further epidemic of subtropical malaria in August, 1912.⁽⁴⁾

Sir Baldwin Spencer, in 1914, mentioned having in his possession a stick from Melville Island marked by more than ninety notches, indicating so many aboriginal deaths from what had appeared to be malaria. These had occurred during a period of two months.⁽⁵⁾

In 1915 Breinl and Holmes, in an examination of 250 islanders, found no clinical signs of malaria, and in blood films from 36 children no parasites were found. In the previous wet season films from 70 adults had also proved to contain no parasites. Breinl and Holmes concluded that malaria was at that time absent from the islands.⁽⁶⁾

No record was found of the presence of benign tertian malaria on the islands, though its introduction by the crews of visiting vessels may be presumed.

Frambrosia.

Two young children suffering from secondary yaws were seen, and lesions attributable to the tertiary stage were present in 25 persons. Two persons suffered from crab yaws.

Pronounced "boomerang" legs were seen in three cases.

In one of these the subject was a girl, aged about eighteen years, and her radius and ulna were also thickened in both arms. On the left side the enlarged ulna was bowed medially. She suffered from severe aching in the deformed tibia, especially at night, when it was said that she frequently cried with the pain.

Another young woman who similarly showed well-developed "boomerang" deformities of the tibiae exhibited also a generalized, roughened thickening of the shaft of the left ulna, to almost twice its normal thickness. Periarticular swelling existed about the wrist associated with the ulnar deformity. While the surface of the deformed tibia on one side was smooth, the other was rough and pitted over a large part of its superficial surface.

Gangosa was seen in three cases.

As the remarkable efficacy of the arsenical treatment of yaws has become known to the natives, and since it does not require the removal of patients from the tribe, children are willingly brought for injections. Missionaries and police officials have been instructed in diagnosis and treatment by officers of the Department of Health, and the effective results of their work, and of that of visiting medical officers, probably accounts for the small number of cases seen.

Ancylostomiasis.

Both at the Bathurst Island Mission and at Garden Point, Melville Island, evidence of widespread hookworm infestation was met. In both these localities of fixed settlement conditions exist which are conducive to high ground infestation.

At the Bathurst Island Mission 114 faecal specimens were examined, in 108 of which hookworm ova were seen. This universal infestation was reflected especially in the physical appearance of the younger children. Most of these exhibit marked protuberance of the abdomen. Many of the older children show retarded development, physical and mental. Since the ages of many of the mission children are recorded, an estimate of this retardation was possible. In many cases the difference between the real and apparent ages, as gauged by the physical and mental development, was pronounced, many children of eight or nine years having the appearance of four or five years. Examples of extreme retardation of sexual development were frequent. In two under-developed girls, aged eighteen and nineteen years, menstruation had never occurred. Another girl, aged twenty years, who had also never menstruated, showed sparse pubic hair and complete absence of breast development. Examples of retardation to a lesser degree were numerous.

Hæmoglobin estimations were made on 33 unselected children, ranging in age from four to sixteen years. The values ranged from 35% to 65% (Hellige), with an average of 53%. Severe clinical signs of anaemia were seen in forty children.

The practice of eating dirt and mud was widespread among affected children, literally handfuls being consumed. In faecal specimens there was frequently a heavy admixture of sand or earth.

Adults, though infected, showed little effect from the parasites.

Helminth Infections.

The results of the examination of faecal specimens for evidence of worm infestation are shown below:

Number of specimens examined	114
Hookworm ova present	108
<i>Enterobius vermicularis</i> ova present	23
Ascaris ova present	2
Strongyloides larvae present	1

Filariasis.

No lesions ascribable to filaria were encountered.

Scars and Wounds.

Practically every adult person displayed a number of scars or wounds. These include hypertrophic tribal scars, which most commonly consist of parallel vertical incisions from the point of the shoulder to about the deltoid insertion, and evenly spaced, parallel, transverse incisions right across the ventral surface of the body at about the level of the costal angle. Sometimes incisions are also made on the chest, back or thighs. The older men carry characteristic herring-bone (or barbed spear-head) scar patterns, which were formerly the common tribal markings, but which are no longer fashionable.

Scars due to incisions made for the relief of pain or disability were also frequently seen, such as vertically placed scars over the forehead for the relief of headache, and in other situations which had been the site of pain—for example, over sprains, abscesses *et cetera*.

Scars from burns and wounds were also widespread, the latter being frequently received in fights. Others due to dog bites (often received in infancy), to boils and abscesses, and to healed ulcers, were also common.

One man, whose leg had been badly mangled by a crocodile, had had the limb amputated at Darwin, and another had lost his leg from below the knee after an injury from a falling tree.

Two persons with artificially perforated nasal septa were seen. These were not local natives, but were from mainland areas, where this custom prevailed.

A curious artificially produced lesion was seen in a man, aged about forty-five years. This consisted of a circular hole, about the size of sixpence, situated at the tip of the nose. This opened the nasal cavity and involved the anterior part of the septum. The alar margins were not affected. The opening was plugged with a rounded piece of pandanus wood. The deformity had been produced during a visit to Port Essington when the subject was a young man; perforation of the septum was attempted with a sharpened bone, in a manner said to be customary there. The operation was a failure, owing to the instrument's slipping forward on the cartilage and perforating the tip of the nose. This produced an irregular wound, which was enlarged and rounded to form the highly individual ornament seen.

Though circumcision was not ritually performed, in a number of persons the operation had been done by visiting medical officers for the relief of phimosis.

Suppurative Conditions.

Suppurative conditions were frequently observed, and about sixty persons were seen who were suffering from furuncles, carbuncles or abscesses. These included three with axillary abscesses, two with mammary abscesses, one with a large ischiorectal abscess, two with infected fingers, and one with an alveolar abscess.

Most of the superficial lesions, such as boils and carbuncles, were seen during the second visit, which was made during the wet season. This period is marked by high humidity and almost constant rain, and it would appear that the dampness and maceration of the skin consequent on these conditions provide for the ingress and growth of the infecting cocci.

One patient suffered from massive inflammation of the floor of the mouth, with profuse drainage from a number of sinuses which opened externally. The condition followed a wound from a fish bone.

From the number of women with scarring of the breast, it was apparent that mammary infection was common during lactation.

Venereal Diseases.

Among those examined, one male suffered from acute gonorrhœa and another from ulcerating granuloma of the pudenda, in an early stage.

Pudendal granuloma is endemic in the coastal region of the Northern Territory and in the outlying islands. Melville Island has long been considered one of the most heavily infected of these areas, and many patients from this island have been taken to Darwin for treatment. Since the treatment is long and tedious and necessitates the transport of patients to the mainland, infected persons

frequently conceal themselves when medical examinations are made.

Two persons were seen who had suffered from blindness from infancy. This followed acute conjunctivitis, which would appear to have been probably of gonococcal origin.

No evidence of syphilis was seen in the natives inspected. Dr. W. B. Kirkland, Chief Medical Officer for the Northern Territory, who has had long practice in North Australia, has never seen a case of primary or secondary syphilis in a local native, and many other practitioners have had a similar experience.

Skin Diseases.

In addition to the suppurative conditions already mentioned, the following were also noted:

Number of persons examined	571	Sore (undiagnosed)	1
Acne	25	Anomalies of pigmentation	3
Acne-like destructive disease	2	Sebaceous cyst	3
of face	4	Melanoma of scalp	1
Fungous infection of skin	27	Verrucae	7
Fungous infection of nails	2	Lipoma	2
Fungous infection of external ear	1	Papilloma	2
<i>Herpes labialis</i>	4	Extensive pigmented moles	9

A peculiar form of skin disease of the face, which caused destruction and scarring of the affected parts, and of which four cases were noted among the natives examined, has already been described in this journal.⁽¹⁾

It was noted that the skin on the dorsum of the feet of many persons was much thickened, dry and rough. It was greyish-white in colour and was frequently cracked, giving a tessellated appearance. The condition was apparently due to constant abrasion from tangled grass and undergrowth.

Developmental Abnormalities.

Congenital abnormalities of the external genitalia were encountered in five related persons. These were reported in a previous number of this journal.⁽²⁾

Two persons with supernumerary ear lobules, one with webbed toes, and one with gynaecomastia, were seen.

Other Medical Conditions.

The following list shows the conditions which were encountered in 571 natives, and which have not been mentioned above:

Cardiac enlargement and insufficiency	1	Ranula	1
Tuberculous cervical adenitis	2	Umbilical hernia	1
Cervical adenitis	2	Incisional hernia (from spear wound)	1
Inguinal adenitis	8	Hernia thoracis (from spear wound)	1
Generalized enlargement of lymph glands	2	Chondroma	1
Adenoids	1	Acute arthritis	5
Otorrhoea	9	Dislocation of hip	1
Deafness	2	Sprained ankle	2
Acute conjunctivitis	7	Fractures (healed)	5
Cataract	1	Chronic osteomyelitis	3
Blindness (unilateral)	7	Ulcers	7
Blindness (bilateral)	2	Contractile ulcers about joints	4
Corneal opacity	6	Genus surus	2
Pterygium	2	Genus valpus	1
Lachrymal abscess (bilateral)	1	Talipes equinovarus	1
Hordeolum	1	Varicose veins	1
Epilepsy (with extensive burns)	2	Abortion (recent)	1
Congenital mental deficiency	2		
Persistent post-traumatic headache	1		

Notes on Parturition.

At the commencement of labour the mother retires to a clump of scrub near the camp, which is customarily used by the women for the purpose. She is attended by her husband's mother and other women.

During delivery she squats on her heels, with thighs separated, leaning back against a tree and post and supported at the sides by her women attendants.

The umbilical cord is cut with an oyster-shell or a flake of glass. Recently, during the process of cutting the cord with a blunt shell, it was torn away from the child, with fatal results.

After completion of the second stage the mother lies at rest for a time, and if the placenta is not spontaneously delivered, it is expressed, often by pressure from the foot of an attendant. The infant is sprinkled with fine wood ashes, which have been prepared in readiness. The mother,

after delivery of the placenta, is placed at rest in a supine position. Her abdomen is covered with ashes and over these warm stones are placed for the relief of pain. After resting for a day she moves about, but does not return to the camp until the third day, when her husband sees the child for the first time.

It was said that, formerly at any rate, in the case of the birth of twins, one of the infants was destroyed by burial. In the case of mixed twins the male child was destroyed, and in the case of children of the same sex the less strong in appearance.

Acknowledgements.

The field work upon which the above observations were based was carried out during my work as an officer of the Commonwealth Department of Health, in September and December, 1939, under the immediate direction and instructions of Dr. W. B. Kirkland, Chief Medical Officer, Darwin.

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BESNIER-BOECK-SCHAUMANN SYNDROME: A DISCUSSION, WITH A REPORT OF TWO CASES.

By L. E. HURLEY, M.D., M.S., F.R.A.C.P.,
Honorary Physician to In-Patients, Royal Melbourne Hospital; Consultant Physician, Royal Australian Air Force,

AND

JAMES F. HUGHES, M.D., D.T.M., M.R.C.P. (London),
M.R.A.C.P.,

Honorary Physician to Out-Patients, Saint Vincent's Hospital, Melbourne; Flight-Lieutenant, Royal Australian Air Force.

BESNIER-BOECK-SCHAUMANN syndrome (Besnier-Boeck's sarcoidosis; benign lymphogranulomatosis) is one of the reticulo-endothelioses, a group of diseases characterized pathologically by proliferation of cells of the reticuloendothelial system. It has a typical microscopic picture, and the condition may be manifested clinically by enlargement of lymph glands, liver and spleen, associated with changes in other organs. During recent years it has become of increasing interest, owing to recognition of its incidence and appreciation of its varying manifestations.

Historical.

Prior to 1914, this condition was known to specialists as a number of localized disease entities. The dermatological manifestations were first described in 1869 by Jonathan Hutchinson, in London, and by Boeck, in Oslo (Boeck's sarcoidosis).

Ophthalmologists then recognized the existence of an atypical irido-cyclitis, which had a tendency towards spon-

taneous recovery; other ocular forms were uveoparotid fever (Heerfordt) and Parinaud's oculo-glandular syndrome (see below). Surgeons, beginning with Klenböck in 1902 and Jungling in 1919, distinguished bone manifestations and called them *osteitis tuberculosa multiplex cystica* (assuming a tuberculous origin). Physicians and radiologists have confused the pulmonary lesions with miliary tuberculosis (see below), whilst other cases have been classified as the Mikulicz syndrome.

It is now recognized, however, largely owing to the work of Schaumann in 1914, and to that of others subsequently, that the above-mentioned are not separate diseases, but localized manifestations of the same systemic disorder. This may be presented in whole or in part in a particular case. Generalized lymphadenopathy is frequently present, and statistically this syndrome is found to be responsible for such cases in a proportion of one to every ten of Hodgkin's disease. This fact should emphasize its incidence and its importance to the medical profession as a nosological entity.

Reports of Cases.

Two cases will now be described in which it is believed that local and general manifestations of the Besnier-Boeck-Schaumann syndrome are presented.

Case I: Parinaud's Oculo-Glandular Syndrome.

W.G.R., a male patient, aged thirty-five years, following an attack of tonsillitis, developed irritation and redness of the conjunctiva of the left eye. This condition was associated with swelling of the left side of his face and neck due to enlargement of the left preauricular lymph gland and of the left submaxillary glands, which were firm, but not painful. The tonsils were infected. The conjunctiva appeared red, non-purulent and slightly granular. The patient was afebrile. The Wassermann test produced no reaction.

An X-ray examination of the chest revealed no abnormality. A blood count gave the following information: the red blood corpuscles numbered 5,830,000 per cubic millimetre, the haemoglobin value was 107% and the white blood corpuscles numbered 9,800 per cubic millimetre; of the white blood corpuscles 53% were neutrophile cells, 1% were eosinophile cells, 23% were monocytes and 23% were lymphocytes. After six weeks the whole syndrome had subsided, and the patient now feels perfectly well.

In 1889 Parinaud described a uniocular affection, clinically resembling granular conjunctivitis, the granulations being sometimes red, sometimes yellow, with mucofibrinous (never purulent) secretion, and an inflammatory swelling affecting the parotid region and extending to the neck. In the midst of this swelling enlarged and softened glands were present. The condition was accompanied by a moderate and irregular fever and subsided after about five weeks. On microscopic examination, many such lesions present the picture of an atypical granuloma with epithelioid cells and wandering cells in follicles closely resembling the cellular arrangements of tubercles. Tubercle bacilli, however, have never been demonstrated. This is the characteristic pathological picture found in the Besnier-Boeck-Schaumann syndrome, and it appears probable that a number of the cases at least of Parinaud's oculo-glandular syndrome belong to this group.

Case II: Besnier-Boeck's Disease.

Corporal R.J.S., aged twenty-six years, eight months before his admission to hospital noted considerable bilateral enlargement of his inguinal and femoral lymph glands. Three months afterwards, in association with abdominal pains and vomiting, glands became enlarged in the neck and axilla, and he was admitted to hospital in Singapore with the diagnosis of glandular fever (acute infectious mononucleosis). The spleen was easily palpable, but no fever or tachycardia was present. The Paul Bunnell sheep's corpuscle agglutination test gave negative results. Blood examination revealed a moderate hypochromic anaemia (haemoglobin value, 82%), whilst the white blood cells were normal in number (10,000 per cubic millimetre) and appearance. Neither the Wassermann nor the Kahn test produced a reaction. The blood sedimentation rate was normal. An X-ray examination of the chest revealed "diffuse uniform infiltration with miliary tuberculosis throughout both lungs".

A piece of gland tissue was removed and examined. The report was as follows:

Lymphoid structure has been almost completely destroyed by proliferated endothelial cells arranged in follicles. There is no caseation, but an occasional tuberculous giant cell is present.

The Mantoux test produced a very weakly positive reaction. The provisional diagnosis made in Singapore was "chronic miliary tuberculosis with tuberculous lymphadenopathy". Splenectomy was advised, and the prognosis was considered poor.

Six months after the onset, the patient returned to Australia. No further symptoms have developed; the glands have slightly diminished in size, and his general condition has improved. He complains only of slight dyspnoea on exertion.

On examination in Australia, he was slightly pale, but afebrile. There was no irido-cyclitis or other ocular abnormality, and the Mikulicz syndrome was not present. Chest examination revealed a few rhonchi only. The spleen was not palpable; but dulness to percussion immediately above the left costal margin was present. The lymph glands of both posterior cervical triangles were moderately enlarged, fleshy, discrete, non-adherent and not tender. Axillary, inguinal and epitrochlear glands were similarly involved. No cutaneous lesions were present. Neither the Wassermann nor the Kahn test produced a reaction, and the blood sedimentation test revealed no abnormality. A blood examination gave the following information: the red blood corpuscles numbered 4,500,000 per cubic millimetre, the haemoglobin value was 85% and the colour index was 0.9; the white blood cells numbered 6,900 per cubic millimetre, 59% being neutrophile cells, 23% lymphocytes and 18% monocytes.

An X-ray examination of the chest revealed diffuse involvement of both lungs, the appearances being consistent with diffuse tuberculous involvement. Subsequent films have shown no pronounced change. An X-ray examination of bones revealed no abnormality. Biopsy of a gland revealed systems of epithelial cells, often concentrically arranged, with a moderate number of small round cells at the periphery of the systems and giant cells of foreign body type, with numerous small centrally arranged nuclei. There was no caseation or calcification, and polymorphonuclear lymphocytes were absent. The section was reported to be characteristic of the Besnier-Boeck-Schaumann syndrome.

The diagnosis had already been reached on clinical grounds. Miliary nodules in the lungs, or disseminated pulmonary lesions radiologically resembling those of tuberculosis, unassociated with fever (*granulie froide*) occur in a number of diseases—healed miliary tuberculosis, miliary carcinomatosis, silicosis, leprosy, vascular stasis, bronchopneumonia, peribronchial sclerosis, Hodgkin's disease, and Besnier-Boeck's disease. Of these conditions, only Hodgkin's disease and Besnier-Boeck's disease are associated with generalized lymphadenopathy. Hodgkin's disease and Besnier-Boeck's disease may be distinguished by their natural history to some extent; but certainty is achieved by microscopic examination of an affected gland, the appearance being characteristic in each disease.

Discussion.

The importance of establishing the correct diagnosis in a case such as Case II is obvious. It replaces the grave prognosis of a more serious disease by one associated with a condition the manifestations of which have a strong tendency towards spontaneous recovery.

Summary.

1. The Besnier-Boeck-Schaumann syndrome is briefly reviewed.

Comment.

Lamble, Professor of Medicine at the University of Sydney: Case II is a typical case of the Besnier-Boeck-Schaumann syndrome, and in view of the importance of recognizing such cases at the present time, when routine radiological examination of the chest of recruits is being undertaken, and when the differential diagnosis of glandular enlargement due to a variety of causes is likely to be of importance to troops serving in the East and Middle East, I think that publication of the case would be timely.

The histological changes in the section of the lymph node are quite characteristic, while the history, symptomatology and radiological appearances of the lungs are quite typical.

Acknowledgements.

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We feel particularly indebted to Professor C. G. Lambie for his interest in, and opinion on, one of these cases, and for his comment; also to Dr. R. Wright-Smith for his report on the histological findings.

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COLLODION SUBSTITUTES.

By H. LEIGHTON KESTEVEN,
 Orange.

DURING 1940, when we were faced by an impending shortage of surgical collodion, it became necessary to look around for a substitute. It had been found that the firmly adherent small dressing which could be obtained with collodion was the most useful for small abrasions and similar wounds in factory workers. It not only kept the wounds clean, but was far less cumbersome than any other dressing available. At this time I was using a specially prepared nitrocellulose, which had been manufactured for me by the officer in charge of the laboratories of the British Australian Lead Manufacturers, Limited, at Sydney; this was employed as an improved substitute for celloidin as an embedding mass for microscopic work. The thinner of the solutions in use for that purpose was tried as a surgical dressing, with entirely pleasing results. My attention had been drawn to an ethylcellulose which was being marketed by Robert Corbett and Company, Proprietary, Limited, of Sydney. I believe that this also is an Australian product. I prepared a solution of this "Ethocel" and tried it also, with equally pleasing results.

After trying these for some time I handed samples of the solutions to Dr. H. R. G. Poate, and he kindly had them tested by the Fellow in Surgery at the Prince Henry Hospital. He tested the nitrocellulose (a) as a 12% solution in equal parts of alcohol and ether and (b) as a 6% solution in the same solvents. The type of nitrocellulose used was "B.A.L.M.". The 12% solution was found to stick well, but was too thick and too irritant to the tissues; the 6% solution was only slightly irritant and stuck well. The third agent tested was "Ethocel", a 6% solution in seven parts of alcohol and five parts of benzol; this was slow in drying, but stuck well and was not very irritant. The report was to the effect that the best of the three solutions tested was the 6% solution of nitrocellulose in equal parts of alcohol and ether.

In a covering letter Dr. Poate expressed the opinion that the "B.A.L.M." nitrocellulose was superior to collodion.

Having now tested the solutions on a large number of patients, I find myself unable to decide that either of the 6% solutions is better than the other, and I am convinced that both are better than surgical collodion. They are more flexible and adhere more firmly. Above and beyond this, they are both much cheaper than collodion, and there is no shortage of supply.

My colleague, Dr. G. M. Dallimore, of the Ministry of Munitions in Victoria, tells me that he has been using "Ethocel" for some time and is well pleased with it. We have both found that the 10% or 12% solution laid on with strips of gauze makes an excellent splint for fractured carpal and tarsal bones without displacement, and it is also useful as a semiflexible splint along the front of the fingers to prevent overflexion in the presence of cuts and abrasions of the dorsum of the finger joints.

So far as I know, neither of these substitutes has been given recognition in our Press, and in view of their value it seems that this omission should be corrected.

Reports of Cases.

TUBERCULOUS SALPINGITIS AND ECTOPIC PREGNANCY.

By J. D. HICKS,
 Research Scholar in Pathology, Women's Hospital,
 Melbourne; Pathologist to Prince Henry's
 Hospital, Melbourne.

THE association of ectopic gestation with tuberculosis of the Fallopian tube is extremely rare. In 1940 Bland¹ tabulated the 32 histologically proven cases which he found in an extensive research of the literature, and added a case which he himself had encountered.

I here report a further example of the uncommon combination.

Clinical Record.

A single woman, aged thirty-one years, was admitted to Prince Henry's Hospital on May 4, 1941. Thirteen years previously her appendix had been removed. There was nothing else of importance in her history, and no family history of tuberculosis. Her general health was good. Her last normal menstrual period had commenced on February 23. Severe abdominal pain first occurred six weeks from that date, and during the following six weeks she had suffered several attacks of pain in the left iliac fossa, the last, four days before her admission to hospital. For one month she had a copious vaginal discharge, yellowish or brown, and sometimes blood-stained. She was examined in the out-patient department, and as she shortly afterwards experienced a further acute attack of pain, she was quickly admitted to hospital. A mass could be felt in the left fornix. She said there was no likelihood of pregnancy.

At operation the lower portion of the abdomen was filled with old clotted blood mixed with some recent haemorrhage. An intraabdominal pregnancy was found on the left side, and a four months' fetus with sac and placenta, the latter in places adherent to bowel, was removed together with the left Fallopian tube and ovary. As the right tube was swollen, it also was removed.

Pathological Report.

The specimen consisted of a fairly well-formed placenta with a ragged maternal surface, and a sac containing a fetus about ten centimetres in length. In a tangled mass of tissue coated with blood clot the left Fallopian tube was traced from its inner portion outwards to the thickened fimbriae and was found to be intact. The outer portion of the tube approached a diameter of two centimetres and on section the wall was seen to be thin and the lumen completely filled with soft white tissue, somewhat friable.

The ovary, coated with blood clot, lay below and behind the middle portion of the tube and contained a large fresh *corpus luteum*, three centimetres long, two centimetres broad and two centimetres thick.

The right Fallopian tube was fairly small, with a rounded swelling near the ampulla. On section the wall was thick and the villi could not be distinguished.

Microscopic examination revealed the fresh *corpus luteum* in the left ovary, which was very congested; portion of the surface was lined by a layer of blood clot, partly organized. The wall of the left Fallopian tube was thin, but the distended lumen was packed with a cellular exudate, partially organized, separating the tubal villi. The villi themselves were swollen with granulation tissue containing a few

caseous areas and numerous epithelioid tubercles, with or without giant cells of the Langhans type.

The wall of the right Fallopian tube was considerably thickened and fibrous, the villi being reduced to three or four blunted processes of fibrous granulation tissue in which were seen a few Langhans giant cells.

Comment.

The tubercle bacillus is held to be the cause of salpingitis in about 5% of cases (Novak),⁽¹⁾ although many authors give considerably higher figures. The infection nearly always reaches the Fallopian tube by way of the blood stream, but spread from tuberculous peritonitis may occur; ascending infection through the uterus is extremely rare. The tubes are affected in about 90% of all cases of genital tuberculosis (Kaufmann),⁽²⁾ and a primary focus is usually found in the lung.

The frequency with which salpingitis is regarded as being tuberculous in nature varies with the source of the material studied and with the different methods of treatment of salpingitis. As a general rule, treatment of acute salpingitis is conservative, operative interference being reserved for the chronic stages of the condition. Tuberculous salpingitis can be definitely proved only by histological or bacteriological examination of the affected tube.

Hence statistics obtained from clinical records may show very few cases of salpingitis to be due to tuberculosis, while pathological records, largely concerned with chronic salpingitis, may show a considerably higher proportion of infections with the tubercle bacillus.

At the Women's Hospital, Melbourne, in-patient clinical figures for the years 1939, 1940 and 1941 record 687 cases of pelvic inflammatory lesions. In 90% of these cases the diagnosis recorded was salpingitis (acute or chronic, gonorrhoeal or non-specific), pyosalpinx, hydrosalpinx, or tubo-ovarian abscess. In the remaining 10%, in which involvement of the tube or ovary was not certain, a diagnosis of pelvic inflammation or cellulitis was made.

During these three years a clinical diagnosis of tuberculous salpingitis was made seven times. In three cases this was confirmed by histological examination of the tube. In two cases of tuberculous peritonitis, one confirmed by biopsy, the tube appeared to be involved. The other two patients had pulmonary tuberculosis, and the accompanying salpingitis was regarded as tuberculous in nature.

The records of the pathological department contain only the above-mentioned three cases of tuberculosis of the Fallopian tube. They occurred amongst 3,700 gynaecological specimens collected in three years. At the same time, 138 specimens of non-specific inflammation of the tube were found.

From clinical records (7 cases in 687) the incidence of the condition is 1.02%, and from pathological records (3 cases in 141) it is 2.13%. These figures are lower than those quoted in most text-books; but they appear to be consistent with Australian experience. Quite a number of further cases of non-specific salpingitis might be added to clinical records if all histories were carefully searched. For instance, in many cases of ectopic pregnancy salpingitis can be demonstrated.

During the same three years in which the seven cases of tuberculous salpingitis occurred, 230 operations for ectopic pregnancy were performed at the Women's Hospital. At Prince Henry's Hospital, amongst general surgical material, one case of tuberculous salpingitis was found by examination of the last 1,000 histological sections. There were 20 cases of non-tuberculous salpingitis. During the same time four ectopic pregnancies, including the present case, were noted.

The effect of a tuberculous infection upon the female genital function is difficult to assess, and the effect of local genital tuberculosis is still more difficult to evaluate. The tuberculous toxin appears to have a general inhibitory effect on ovarian activity, menstrual irregularities and amenorrhoea being frequent symptoms of phthisis.

Reifferscheid⁽⁴⁾ reported amenorrhoea in 85% of cases of extragenital tuberculosis. Arrested development of the primordial follicles, and in some cases their atrophy, have been demonstrated in the ovaries of tuberculous women by Brack.⁽⁵⁾ The incidence of pregnancy in association with extragenital tuberculosis is low—at the Women's Hospital, 0.5%. The lesion present is generally in the lung and is often quite active. These tuberculous patients are a selected group, and the population from which they are gathered is probably much larger than that in which normal pregnancies occur.

Of the seven patients with tuberculous salpingitis treated at the Women's Hospital in the last three years, five were

married, but only one had become pregnant. She had borne twins five years before her admission to hospital on account of the salpingitis; this, however, was not histologically verified as due to tuberculosis. These cases appear to fall into line with the idea generally held as to the sterility of patients with tuberculosis, especially when the genital tract is affected.

Wharton and Stevenson⁽⁶⁾ discuss the relationship between genital tuberculosis and both intrauterine and extrauterine pregnancy. They quote statistics from Feuillade,⁽⁷⁾ who collected 24 cases of intrauterine pregnancy associated with tuberculous salpingitis. In seven cases conception did not take place until after recovery from the infection, or five to ten years after the attack. Of the seventeen pregnant women with an associated active tuberculous salpingitis, only five came to term, and three at least of the babies died of tuberculosis within a few months of birth. Sixteen of the seventeen mothers had serious exacerbations of tuberculosis, mainly pelvic in type, and a fatal termination occurred in eleven cases.

The outlook for intrauterine pregnancy in the presence of an active tuberculous salpingitis is thus extremely poor.

Wharton and Stevenson found reports of only seventeen cases of extrauterine pregnancy coincident with tuberculous salpingitis. In nine cases the gestation was in the Fallopian tube, in three it lay between the fimbriae and the ovary, and in four it was completely abdominal, the tube and the uterus being intact. It is of interest that the *corpus luteum* of pregnancy was sometimes found in the opposite ovary. One thus gains the impression that, while the lumen of the tube may not be impervious to the passage of spermatozoa, the fertilized ovum is obstructed in its journey down towards the uterus. In about half the cases the obstruction is so complete as to deny even an entrance into the tube, and the ovum must find a site for embedding itself within the abdomen, or perhaps between the fimbriae and the ovary. It may even attempt to reach the uterus by traversing the pelvis and gaining entrance to the opposite tube.

Summary.

A case is reported of bilateral tuberculous salpingitis associated with a ruptured intraabdominal pregnancy.

The incidence of tuberculous salpingitis in the pathological records of the Women's Hospital is approximately 2%, a much lower figure than is reported in other parts of the world.

Attention is drawn to the relative sterility of tuberculous patients and to the poor prognosis for those with genital lesions who unfortunately have become pregnant.

Acknowledgement.

I thank Dr. L. S. Kidd, of Prince Henry's Hospital, for permission to publish this case report.

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Reviews.

THE LIFE STORY OF AN ARMENIAN DOCTOR.

AUTOBIOGRAPHIES are not always worth reading, but the life story of Avedis Nakashian, an Armenian doctor, is exceptional.¹ The most blasé medical man or woman will find something of interest or amusement in it; at the same time it deals with a country and people which are but little known even among the well informed. Nakashian was born in Aintab in Turkey and was the son of an Armenian

¹ "A Man Who Found a Country", by A. Nakashian; 1941. London: George Allen and Unwin Limited. Demy 8vo, pp. 288, with 2 plates. Price: 12s. 6d. net.

carpenter. He wanted to study medicine and after much tribulation graduated in an American missionary college in his native town. To graduate in this college did not confer on the graduand the right to practise in Turkey; the State examination had to be passed. The prejudice shown by the examiners and the difficulties put in the way of candidates are almost incredible. However, Nakashian succeeded where another not so stout of heart would have failed. He explains his success throughout his life by remarking that *Kismet* was with him. His adventures in practice were thrilling and diverse. He treated the highest officers in the State and also the humblest. He visited, or more correctly was compelled to visit a bandit chief and to treat him and many of his subjects. He was imprisoned with other Armenians and was freed just before the group with whom he had been gaoled were slaughtered. He operated on a Kurdish patient for stone in the bladder. The Kurd could not pay a fee, but said he would pay later on. Payment was made by a gift of the patient's daughter, aged twelve years—the marriageable age in Turkey. Only after great trouble could the Kurd be persuaded to accept the treatment as a gift. The war of 1914-1918 comes into the story, for Nakashian found himself compelled to serve as an officer in the Turkish Army. The incidents connected with this period of his life are full of interest. At long last Nakashian leaves the turbulent East and sails westward where after a particularly unsavoury stay at Ellis Island, he finds sanctuary in the United States of America. This is the country that he found and the story ends when he finds it. No medical reader will regret the time spent on this book, particularly if he has not grown too old to be fascinated by tales of adventure.

LECTURES TO NURSES.

THE fact that "Lectures to Nurses", by Margaret S. Riddell, has gone to the eighth edition shows the popularity of the work.¹ The present edition is claimed to be revised and enlarged. The book is well arranged and divided into three sections: (1) ten lectures for first year probationers, (2) ten lectures for second year probationers, and (3) twelve lectures for third year probationers. The last include a lecture on obstetrical nursing, which in this country is a separate course in itself. In addition there is an excellent glossary of technical terms and a very useful index. The list of metric and imperial quantities is clearly put and will be of great service. The first chapter on hospital etiquette is full of good advice on "Trustworthiness and Accuracy", "Obedience", "Tact" and "Observation". Reticence might have been added as a virtue in a nurse, for all too frequently it is found that nurses are prone to talk of their cases with other patients. It is pleasing to note in the chapter on urine testing that the salicyl-sulphonic test for albumin is described as the most satisfactory. The effect of salicylates on the ferric chloride test for diacetic acid is omitted. In lecture 1 to second year probationers, in the description of the various ways of giving drugs, is mentioned "Intravenous infusion", which surely would be better "intravenous injection". In regard to the administration of "M & B 693" the old superstition of suppressing those foods containing sulphur is perpetuated. "Eggs, onions, and garlic" are specially mentioned, although the two last mentioned are unlikely to be included in the diet of an acutely ill patient. Such sulphur-containing foods as potatoes are not mentioned as taboo. Surely the toxicity of the drug itself is the most important thing in its administration and watch must be kept for individual susceptibility.

On page 390 a bad misprint occurs. The sentence reads "They are placed in an antiseptic lotion till required". It refers to rubber drainage tubes, and presumably should be "they are boiled and . . ." Esmoldil (page 84) is misspelt Esmoldil.

The book is well illustrated, the text and general set-up are good, and the style of writing makes the book easy and interesting reading.

SKIN DISEASE IN GENERAL PRACTICE.

A SECOND edition of Sulzberger and Wolf's "Dermatologic Therapy in General Practice" has been printed a little more

¹ "Lectures to Nurses: A Complete Series of Lectures to Probationary Nurses in their First, Second and Third Years of Training", by Margaret S. Riddell, A.R.R.C., S.R.N.; Eighth Edition; 1942. London: Faber and Faber Limited. Crown 8vo, pp. 630 with 65 illustrations. Price: 7s. 6d. net.

than a year after its first appearance.¹ This edition has been completely revised and brought up to date. New material includes the treatment of burns and skin damage caused by poison gas, the use of the sulphonamides in dermatology, and the prophylaxis of syphilis.

No attempt is made to discuss the rarer dermatological conditions, nor to describe the special superficial treatments with X rays and radium. The book concentrates on the treatment of the more common skin conditions, although the descriptions and the differential diagnoses are brief but good. Therapy is considered in the minutest detail, even to the extent of showing an illustration of "Clothespin covered with cloth for application of ointment" (page 328).

The chapter on the sulphonamides is short but good. A table on the toxic and allergic manifestations of these compounds is worth close study. The authors are conservative in the use of these drugs, maintaining that a potentially dangerous drug should not be used for a dermatosis which will respond to external treatment.

Various new ideas such as the use of histamine in urticaria and of benzyl benzoate in scabies, and the fact that scabies is not usually transmitted by fomites are mentioned; a notable omission is Eidenow's method of the treatment of non-malignant post-radiation necrosis by massive doses of ultra-violet light.

One of the best chapters in the book is that on pruritus. The aetiology and treatment of this outstanding symptom in dermatology which at times will tax all our ingenuity to relieve is discussed most thoroughly. The chapter ends with this paragraph: "A thorough acquaintance with pruritus, its common occurrences, varied significance and sometimes dreadful consequences leads to the inevitable conclusion that it is the duty of every physician to know the causes and treatment of itching as well as he knows the causes and treatment of pain."

This is a book that the general practitioner at all interested in skin diseases and the dermatologist should not be without.

Notes on Books, Current Journals and New Appliances.

TALKS BY A MUSIC CRITIC.

SINCE Mr. Neville Cardus has been in Australia his criticisms of music and his talks on the air have been followed with interest by the musical public which includes many members of the medical profession. A series of talks delivered over the network of the Australian Broadcasting Commission has been published in book form.² They make an attractive and entertaining volume which at the same time has a certain teaching value. Mr. Cardus insists, and none will deny that he is right, that no one is justified in saying that he does not like a piece of music until he has heard it often enough to understand its "language". (This might be used as a parable to point a moral in more than one field of medicine.) Mr. Cardus's views are forthright and sometimes provocative. The talks are attractively put together and often amusing. The reader gathers that the job of a music critic is most important, and so it is. Though Mr. Cardus gives this impression, he does not take himself too seriously and he can laugh at himself; anyone reading this book should not miss the last chapter. He tells the story of a Cambridge don who once wrote to Sir Walter Scott drawing attention to a heap of historical inaccuracies and anachronisms in the "Waverley" novels. Scott replied thanking his correspondent; he also appended an additional list of historical inaccuracies which had presumably escaped the don's attention. Were it not for this story we might point out that "The Trumpet Shall Sound" is a bass and not a tenor solo; but it would be disconcerting to receive from Mr. Cardus a list of other errors. Doctors with a love of music are advised to buy this book; it is a good half-crown's worth. It is a book for the fireside and not for bed. The chapters are short and if the book is read in bed the tendency will be not to turn out the light but to read "just one more" because it is "only short" and one wonders what Mr. Cardus "will have to say about that".

¹ "Dermatologic Therapy in General Practice", by Marion B. Sulzberger, M.D., Lt. Comdr. (M.C.), U.S.N.R., and Jack Wolf, M.D.; Second Edition; 1942. Chicago: The Year Book Publishers, Incorporated. Demy 8vo, pp. 652 with 67 illustrations. Price: \$5.00 net.

² "Music for Pleasure", by Neville Cardus; 1942. Sydney: Angus and Robertson Limited. Demy 8vo, pp. 116. Price: 2s. 6d. net.

The Medical Journal of Australia

SATURDAY, SEPTEMBER 12, 1942.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

Reference to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

OLD AGE, YOUTH AND EFFICIENCY.

THAT today is the day of the young man is a commonplace remark the truth of which has become more apparent than ever since the outbreak of war. The flying officers and men of the air forces probably come first to the mind as having won for youth a crown of immortal glory, though there are in all the Services many others of whom the same remark might be made. More than one writer has proclaimed the fact that it was the young men who won the war of 1914-1918 and has added what many will accept as true—that the same war was nearly lost by the elderly politicians. On previous occasions it has been shown in these pages that as a result of the interaction of many factors old age is increasing while youth is on the wane. Age periods are being extended and in ordinary times, that is, in the absence of a world war, the young men and the young women of the community are at a great disadvantage (see THE MEDICAL JOURNAL OF AUSTRALIA, June 25, 1938, page 1101). These conditions present a social problem of great magnitude. Shortly, several remedies suggest themselves. A barbaric race would say that the older people, those, for example, over fifty or perhaps sixty years of age, should be put into a lethal chamber, or, to use an up-to-date expression, be made the subjects of a "purge". More humane peoples might suggest that all persons over a certain age should be pensioned; but this might lead to a state in which the pensioners were more numerous than the workers. A community with sufficient insight and determination would overhaul its whole economic structure, or at any rate would investigate the possible effects of so doing, in order to give the younger members a chance to develop and display their capabilities. But medical men and women have to deal with conditions as they are, that is to say, they have to make the non-medical men and women (and indeed themselves) as fit in body and as keen in mind as possible, that they may be able to provide for themselves and not be a burden on others. This does not mean that doctors should not take a part, and perhaps a leading part, in any plan or effort to give youth its chance and not to deny to age its due.

Since in the normal relationship today of youth to age youth is at a great disadvantage, the reason must be stated. The most obvious reason has already been mentioned—the increasing number of old men who stand in the way of the young men. The position need not be laboured, for it can be seen on every hand. One of the younger members of the staff of an Australian university complained in semi-serious mood recently that the senior members of the staff were allowed to hold positions long after their hormones had dried up, and that when a younger man at length was given a chance he was so weary of waiting and depressed by being kept in the background that his own hormones were in a parlous state. This irreverent remark contained more than a germ of truth. Walter Murdoch writes in one of his essays that after forty a man can do little but repeat himself. Murdoch makes this statement at the beginning of an essay on "Crabbed Age"; and at the end of his essay he refuses to point a moral, but refers to a "line of inquiry". The inquiry is full of interest. When arterial changes occur in the cerebral circulation and cerebral softening takes place, then have we the last of Shakespeare's "seven stages", that of "second childishness and mere oblivion". Before this stage is reached, others dependent on pathological changes occur. Clifford Allbutt wrote that "in medicine we do not count the ages of people by the revolutions of the earth round the sun, but we measure them by the revolution of their own morbid processes".¹ But apart from pathological changes in the tissues much depends on habit and training. What is not exercised will atrophy. As Mortimer Collins wrote: "The true way to render age vigorous is to prolong the youth of the mind." Of course, some fortunate persons have no need to seek this prolongation, for they are gifted with a temperament that seems to endow them with perpetual youth, in mind and spirit, if not in body. There are then many exceptions to the statement made by Walter Murdoch. He refers to many of them himself and they have no doubt been mentioned by almost all writers on this subject. No one makes a happier reference than Longfellow in "Morituri Salutamus":

Ah, nothing is too late

Till the tired heart shall cease to palpitate.
Cato learned Greek at eighty; Sophocles
Wrote his grand Oedipus, and Simonides
Bore off the prize of verse from his peers,
When each had numbered more than fourscore years,
And Theophrastus, at fourscore and ten,
Had but begun his "Characters of Men".
Chaucer, at Woodstock with the nightingales,
At sixty wrote the Canterbury Tales;
Goethe at Weimar, toiling to the last,
Completed Faust when eighty years were past.
These are indeed exceptions; but they show
How far the gulf-stream of our youth may flow
Into the arctic regions of our lives,
Where little else than life itself survives.

When the gulf stream of youth flows into the arctic region of life, there is within the old man, a young man—"within the sophisticated, one unsophisticated", and creative effort can still be undertaken.

That it may be possible by therapeutic measures to halt the process of ageing has recently been suggested by V. Korenchevsky in an article that is worthy of careful

¹ T. C. Allbutt: "A Post-Graduate Clinical Demonstration", Volume V, 1894, page 117, quoted by V. Korenchevsky, "The War and the Problem of Aging", *The Journal of the American Medical Association*, June 20, 1942, page 624.

study.¹ Korenchevsky's article, which is extremely well documented, is really a plea for research on the practical problem of ageing. (Incidentally he regards this problem—and we do not agree with his contention—as one of the urgent tasks connected with the war.) He shows that the process of ageing of several functions and capacities starts in the human organism at the age of twenty-five or thirty years, or even earlier than this, and that from the practical point of view this decrement with ageing of some functions and capacities becomes considerable from the age of fifty or more and especially from the age of sixty years. Korenchevsky is careful to emphasize the fact that the conditions of the functions and capacities in some young people can be as "old" as or "older" than their average at the age of sixty or seventy, and conversely, in some people of fifty to seventy their condition can be equal to or better than the average of these features at the age of twenty to twenty-five. He is concerned particularly with the sex, thyroid and adrenal glands and with vitamins, and he holds that clinical research should be undertaken to elucidate the favourable effect which preparations of these substances have been reported to have on old people. In support of this contention he points out that there is sufficient evidence to indicate (a) that pathological changes occur with ageing in the sex glands, the thyroid and the adrenals; (b) that a similarity exists between certain senile changes and some features of deficiency of these glands and also of vitamin deficiency. If the reported benefit from these substances could be proved they might be used, he thinks, to lessen the effect of great strain and to increase working capacity.

Korenchevsky's ideas are worth while and doubtless some of the substances mentioned by him would be useful in prolonging "the youth of the mind". They would not be likely to confer a youthful mind on a person without one. An ageing man who is still receptive of new ideas and does not always maintain that old ways are best, whose interests do not become restricted to an ever-narrowing field, and who does not resent criticism from a competent critic whether the critic is older or younger than himself, may be looked on as having a youthful mind. Such a man will be much more likely to give younger men a chance to collect experience and achieve wisdom than one who remains stuck in his place "when his hormones have dried up". It is only by men with understanding, generosity and sympathy of their kind that the vicious circle enslaving the youth of today may be broken. It is a paradox to suggest that medical therapy, by prolonging the youth of the mind of ageing man, may open the way for the courage and advance of youth; but stranger developments have occurred and the idea should be investigated.

Current Comment.

FETAL AND NEO-NATAL MORTALITY.

WITH a diminishing birth rate, the study of the causes of fetal mortality becomes increasingly important. There is, of course, an inherent potential mortality in the newly born, just as there is in young and tender plants. In the plant world Nature provides for this by a prodigality of blossom and seed; she pays an immensely generous

premium to insure the survival of the strain. In this respect, as in some others, civilization with its small, "planned" families is "agin Natur"; but there is this, at least, to be said for modern civilization—it shows great concern for the welfare of such embryos as are permitted to develop. Anthony D'Esopo and Andrew Anthony Marchetti² have made a careful and painstaking study of the causes of 1,000 fetal deaths occurring among 25,823 deliveries at the New York Lying-in Hospital and the Sloane Hospital for Women. The gross fetal mortality rate was 4.03 per hundred live births; this includes some pre-viable premature infants. If only viable infants are included, the rate is 3.66%. The authors were led to make this study by a consideration of the increasing Cæsarean section rate in the United States. They point out that the widespread practice of birth control places an ever-increasing emphasis on the importance of delivering a normal healthy child for each planned pregnancy. The obstetrician may find himself in the position of recommending Cæsarean section simply to make sure of a live baby. While this may offer the easiest way out of a difficult situation, no one can overlook the fact that the risk to the mother is considerable. D'Esopo and Marchetti believe that it may be possible by a study of the causes of fetal death to make pelvic delivery increasingly safe for the child, and thus to lower both the foetal and maternal mortality. The two are inseparable, and one cannot be sacrificed at the expense of the other.

Of the thousand deaths reviewed, only 16 occurred among unregistered patients and in 89.3% of deaths autopsies were performed. Fairly complete data were thus available, but even so it was difficult to assign the cause of death justly in every case. As an instance, the authors consider the intracranial haemorrhages found in the premature infant.

Frequently these occur as small subarachnoid or intraventricular haemorrhages with no evidence of injury to the dura, while the lungs, pleura, pericardium, thymus, adrenals and other viscera show the ruptured capillaries so characteristic of asphyxia. In such a case, it is a matter of individual interpretation to ascribe the intracranial findings either to birth injury or to asphyxia. What is the significance of haemorrhage into the lung? Is it related to the haemorrhagic lesions of the newborn or does it represent evidence of intrauterine asphyxia? What is the significance of masses of amniotic cells in the lungs? Are they evidence of asphyxia followed by aspiration of amniotic fluid or cells or is their presence physiologic, as a part of the so-called flow of amniotic fluid? What is the relationship of congenital pneumonia to asphyxia?

These and many other questions are difficult to answer. In a statement of the cause of death, the obstetrical history may be just as important as the autopsy findings. It is thus not sufficient to ascribe the death of a child to intracranial haemorrhage; an attempt must be made to state the cause of this haemorrhage, whether it is foetal, as from extreme prematurity, haemorrhagic disease or asphyxia; or maternal, as in extreme disproportion or precipitate delivery; or extraneous, from the well-intentioned but ill-judged help of the *accoucheur*. In the authors' series, asphyxia was the commonest cause of foetal death, prematurity came second, congenital abnormalities third and maceration of unknown aetiology was in the fourth place. The next most common cause was birth injury, accounting for 115 of 1,000 deaths. The incidence of foetal death was lowest among women between 20 and 24 years of age. In labours that exceeded thirty hours in duration, the foetal mortality rate was doubled. Spontaneous deliveries show the lowest foetal death rate; high forceps deliveries the highest. Of the foetal deaths in mid forceps deliveries, 46.1% were due to birth injuries.

The authors state categorically that interference should be avoided unless absolutely justifiable; the best results are obtained in spontaneous deliveries. They would, we think, enjoy the recent mistake of a typist who made "instrumental devilry" out of instrumental delivery. Forceps have their uses in skilful hands, but the best obstetrician is he or she who knows how to do without

¹ V. Korenchevsky: *Loco citato*.

² American Journal of Obstetrics and Gynecology, July, 1942.

them. D'Esope and Marchetti advocate research and yet more research into labour, the causes and early detection of uterine inertia and other factors influencing birth. Their article merits careful study by all obstetricians.

NAIL PUNCTURE WOUNDS OF THE FOOT.

THE puncture of the foot by a nail is an event which often causes apprehension to the patient and some anxiety to the medical attendant. The procedures adopted for its treatment include probing and the injection of some form of antiseptic and the establishment of drainage. A report on the results of the treatment of 661 wounds of this kind comes from F. H. Bowen who treated patients injured in the construction of a United States naval air station.¹ Bowen thinks that much of the treatment adopted for this condition is unnecessary and is followed by longer periods of disability than are required. He has found that a nail coated with gentian violet, if driven into a cadaver's foot, is wiped clean in the proximal quarter inch of the tract. When he carried out superficial *débridement* on his patients he found that particles of sand lay just beneath the epidermis and occasionally rust particles or little pieces of concrete or rubber were found in the same position. He also found that the introduction of a drain into a non-infected wound tended to convert it into an infected wound. On the anatomical side Bowen points out that the foot is a complex unit and that one layer of fascia tends to slide over another when the foot is used in walking. Hence when the patient walks from the place where he is injured to the place where the foot is dressed, the tract resembles a staircase more than a straight line. He concludes that probing will therefore be harmful—it will injure tissue not damaged by the nail and will open up to infection new planes of tissue.

As a result of these observations Bowen has evolved the following simple form of treatment. The foot is soaked for fifteen minutes in hot water to which liquid soap or a saponated solution of cresol has been added. The foot is then dried carefully and an area around the wound about two or three inches in diameter is painted with tincture of mercurisin (ortho-hydroxyphenyl-mercuric chloride). The wound edges are grasped with splinter forceps and the epidermis is cut away for several millimetres about the circumference of the wound. Foreign matter is thus exposed and can be wiped away. The wound is not probed beyond a quarter of an inch and this is done under direct vision. A dry dressing is applied and 1,500 units of tetanus antitoxin are given. If the nail was small the patient in Bowen's series returned to work at once; otherwise he did not return for one or two days. The patient soaked his foot again several times in hot water to dilate the capillaries and cause an exudation of lymph into the affected area. In the series of 661 wounds treated in this way there was no tetanus; no deaths occurred. Cellulitis occurred in some cases (the details are set out in a table). The average disability per case was 0.6 per day; this does not include cases in which disability occurred and was due to the administration of tetanus antitoxin. Bowen points out that in this series he has included only those patients who came for treatment on the day on which the injury occurred. He adds that no sulphanilamide treatment of any kind was given.

This story of conservative treatment is instructive. It may well be borne in mind when injuries of this kind are encountered. Had chemotherapy been used by Bowen it is likely that the cases of cellulitis would have been even fewer than they were. If the nail causing the injury was at all large it might be useful to apply sulphanilamide powder to the wound, though if the wound was in a place where Bowen's "staircase" description would apply, the tract would have to be opened up for the drug to be effective. The timely oral administration of sulphanilamide would sometimes be likely to abort or perhaps prevent cellulitis. Experience will be a guide to this part of the treatment—but, of course, very few practitioners

see anything like six hundred wounds of this kind in a series. In surroundings likely to yield such a harvest it would be worth while to pay particular attention to the footwear of employees and to do something about the number of nails lying in wait, or should we say standing up, in readiness for the unwary or the poorly shod. In any case the use of tetanus antitoxin must not be omitted.

SULPHONAMIDE DRUGS AND IMPETIGO.

THE skin condition known as *impetigo contagiosa* may be difficult to cure. Molesworth states that according to English and French schools the condition is due to a special variety of streptococcus, but that German workers distinguish between *impetigo staphylogenous* and *impetigo streptogenous*. In *The Lancet* of September 16, 1941, Robert Cruickshank reported on 23 cases of impetigo; he isolates a β -haemolytic streptococcus in 15 and *Staphylococcus aureus* in 18 of them. B. E. Schlesinger and N. H. Martin in a recent report² state that they have recovered both the organisms described by Cruickshank in 42% of 190 consecutive cases; they recovered *Staphylococcus aureus* in 47% and β -haemolytic streptococci in 11%. These findings are of importance in regard to treatment which Schlesinger and Martin have carried out by the oral administration of sulphonamide drugs. All their patients were males between the ages of eighteen and forty-five years. Most were between twenty and thirty-five years of age. The one exception was a female child of two years. Most of the patients had had some form of treatment before they passed into the hands of Schlesinger and Martin. The average duration of the disease before the sulphonamide drug was used was thirty days. At first eighteen grammes of the sulphonamide were given in four days, but this was not satisfactory, so the dose was increased. Twenty-four grammes were then given in a five-day course beginning with six grammes, or in a six-day course beginning with seven grammes. The patients were kept in bed while the drug was given. Fifty patients were given sulphanilamide by mouth, 26 were cured; 35 were given sulphapyridine by mouth, 21 were cured; 46 were given sulphathiazole by mouth, 38 were cured; 10 were given sulphadiazine by mouth, 8 were cured. Schlesinger and Martin conclude that sulphathiazole and sulphadiazine are the "drugs of choice"; they add, however, that when streptococci are the predominating organisms, sulphanilamide or sulphapyridine is nearly as satisfactory, provided adequate concentrations are maintained. The conclusion is possibly justified in relation to sulphathiazole, but not in regard to sulphadiazine, since the cases treated with that drug were so few. For all that, this paper should be read by all who may have to treat patients with impetigo.

THE WAR, QUININE AND THE MEDICAL PROFESSION IN AUSTRALIA.

THE attention of readers is directed to the text of an order controlling the use of quinine published on page 248 of this issue. The order has been made under the National Security (Medical Co-ordination and Equipment) Regulations. Under its provisions medical practitioners are forbidden to prescribe quinine alkaloid or the salts of quinine for any purpose other than the treatment of malaria. No quantity exceeding fourteen days' supply is to be prescribed; the prescription must be endorsed with a statement specifying the number of times it is to be dispensed and with the words: "For the treatment of malaria only." In addition the practitioner must state the name and address of the patient and he must include his own address as well as his signature. This order is the logical outcome of the conditions mentioned in the leading article of August 1, 1942, dealing with this subject. That this unusual step has had to be taken is an indication of the gravity of the quinine situation.

¹ *The Journal of the American Medical Association*, May 30, 1942.

² *The Lancet*, May 2, 1942.

Abstracts from Medical Literature.

MEDICINE.

The Third Bile Fraction.

EMPHASIS is placed on the chemical examination of the bile by M. E. Rehfuss (*The American Journal of Digestive Diseases*, November, 1941). By duodenal intubation and aspiration it is possible to collect three different specimens which in health follow a definite pattern after the injection of certain substances. The first specimen is recognized as duodenal, the "A" fraction; the second, more concentrated and darker, called the "B" fraction, is predominantly gall-bladder bile. At varying intervals after the injection of stimulants a third or "C" fraction, paler in aspect, is generally considered to be predominantly liver bile. It is fully recognized that none of these specimens is absolutely pure, as the stomach, duodenal wall, biliary ducts, gall-bladder and liver all concentrate the bile in some measure, but for all practical purposes the original division into the three aspirates is acceptable. Lyon and his co-workers have already demonstrated the value in diagnosis of information based on colour sequences and the microscopic appearance of the "A" and "B" aspirates, but this does not take into consideration the extremely important fact of liver efficiency, for the gall-bladder is only a part of the biliary tract and is not indispensable. From further studies it is possible that the specific gravity presents a convenient method for demonstrating gall-bladder concentration and this is probably superior to colour sequence of the various fractions. The examination of the "C" fraction for its nitrogen content gives valuable results. Uric acid nitrogen is not high, but the non-protein nitrogen, particularly the urea and ammonia fractions, exceed blood levels by 50% to 100% above normal. It is therefore suggested that duodenal intubation may provide another weapon in reducing certain abnormal non-protein fractions from the blood in selected cases. Duodenal drainage does something more than clear the ducts, it removes a variable amount of bile possessing chemical and possibly toxic properties, which cannot be demonstrated in ordinary manner.

Cancer Recurrences.

J. H. D. WEBSTER (*The Practitioner*, April, 1942) has successfully predicted recurrence of cancer in more than 100 cases, and states that the time intervals are multiples of 33 weeks (± 3 weeks), or of the half period. Such predictions have enabled him to treat recurrences at the earliest, for it is possible to tell the patients just when to return for examination. As clinical and experimental work has shown that rapidly dividing cells are more sensitive to X rays or radium than resting cells, tumours at the often brief peak of activity at the onset of a recurrence are likely to respond best, and to smaller doses of rays. Previously, statistics have shown that the treatment adopted, by any method, for cancer recurrences, rarely gives as

good a final result as does treatment for the primary disease, and it is anticipated that not only will time and expense be saved, but the end results should be far superior when treatment is based on prediction. Ultimately the author hopes by this method not to treat recurrences, but actually to prevent them.

X-Ray Therapy in Thyreotoxicosis.

LAURENCE MARTIN (*The Quarterly Journal of Medicine*, January, 1942) discusses the results of X-ray therapy in thyreotoxicosis based upon a review of the literature and a follow-up study of 42 patients, who were kept under observation from periods of three to fourteen years after cessation of treatment. The author suggests the following indications for the use of X-ray therapy in thyreotoxicosis: (i) primary thyreotoxicosis of such a degree that severity does not demand early operation, or the mildness of which suggests autonomic imbalance rather than true thyreotoxicosis; (ii) primary thyreotoxicosis in children or adolescents, in whom one is reluctant to advise operation for fear of upsetting the endocrine balance at a critical age; (iii) elderly patients with primary thyreotoxicosis and no cardiac failure or arrhythmia; (iv) cases of primary thyreotoxicosis in which partial thyroidectomy has been inadequate; (v) cases of primary thyreotoxicosis in which the patient refuses operation or his extreme dread of it threatens mental breakdown. The author suggests the following contraindications to X-ray therapy: (a) cases of secondary thyreotoxicosis or toxic nodular goitre; (b) primary or secondary thyreotoxicosis with cardiac failure or auricular fibrillation, whether paroxysmal or established; (c) any case in which the goitre is causing tracheal compression or deviation, or mediastinal pressure; (d) very severe primary thyreotoxicosis when quick relief by surgery is essential; (e) cases of non-toxic goitre, autonomic imbalance, or doubtful cases of thyreotoxicosis. The author states that in a suitable case, X rays or surgery can only do the same thing by different methods, namely, eliminate hyperplastic thyroid epithelium. A patient upon whom thyroidectomy would confer no benefit would also derive no benefit from X-ray therapy. X-ray therapy has many advantages in the treatment of primary thyreotoxicosis, for the empirical operation of thyroidectomy is avoided, subsequent tetany is unknown, the risk of hypothyroidism and cosmetic blemishes is now very small, the treatments themselves are painless and not frightening and carry no mortality, and the results in suitable cases do not compare unfavourably with those of surgery. The acknowledged drawback of X-ray therapy is that it takes a long time, and many patients of the hospital class cannot afford to be idle for the necessary period of treatment and observation, especially when surgery offers them quicker relief. Selection of the cases suitable for X-ray therapy is often difficult, for not only has thyreotoxicosis itself to be proved beyond doubt, but the essential decision has to be made whether or not a case is of the primary type; in some cases this is impossible on clinical grounds alone. Further, the thyreotoxic element of the disease cannot as yet be clearly

separated from the constitutional nervous instability which remains unaffected by X rays (or surgery) and may still cause incapacity after relief of the thyreotoxic element. The ability to assess the relative amounts of these two components in primary thyreotoxicosis would be a major advance in knowledge of the disease, and would lead to better results of treatment. In the author's series of 42 cases, relief of thyreotoxic symptoms occurred in 28 of 31 cases of primary thyreotoxicosis, but only 19 of the patients with this type had been able to resume a normal life. Only one of seven patients with secondary thyreotoxicosis was relieved of symptoms, four had died, and one was bedridden. The condition of four patients with non-toxic goitre was not improved.

Gastro-Intestinal Absorption.

GASTRO-INTESTINAL absorption plays an important part in deficiency diseases; absorption may be impaired because of the anatomical, chemical and physiological changes responsible for the deficiency state and defective absorption may be produced by the disease itself. Most of the present evidence for faulty absorption from the human gastro-intestinal tract is indirect clinical evidence. A. J. Beams *et alii* (*The American Journal of Digestive Diseases*, November, 1941) give some results from the use of the galactose absorption test. The method involves the oral administration of the sugar after a fast of fourteen hours, the emptying of the stomach at the end of one hour by tube and the determination of the galactose content of the specimen, and blood and urine examinations. Intravenous galactose tolerance tests were also carried out on a number of the patients who were suffering from deficiency diseases; normals were also included. All the patients with active pellagra and non-tropical sprue showed evidence of impaired absorption. Improvement in absorption accompanied clinical improvement in pellagra, but not in sprue. Two of four cases of rosacea keratitis which responded to riboflavin therapy gave indication of decreased absorption which improved when the signs of rosacea keratitis disappeared. Approximately one-half of the patients with pernicious anaemia showed impaired absorption, but improvement in the blood state was not paralleled by improvement in absorption.

Gastric Observations in Achlorhydria.

THE problem of achlorhydria and the condition of the gastric mucosa is the subject of an article by J. B. Carey *et alii* (*The American Journal of Digestive Diseases*, November, 1941). It is pointed out that anacidity or achlorhydria is more likely to be evidence of disease of the stomach than any other variation of gastric secretion. The incidence of the finding of anacidity increases with age and is frequently higher in women. The percentage incidence varies according to investigations and test meal used, from 12.2% with histamine to 30% with ordinary test meal. The authors determined that among a series of 661 persons subjected to test meal examination with histamine stimulation and without apparent

gastro-intestinal disease, there was an incidence of 17.4% amongst males and 22.3% amongst females who failed to secrete acid. Two hundred and thirty-three of these patients were further examined by gastroscopy when the following diagnoses were made: atrophic gastritis, 132 cases; superficial gastritis, 44 cases; carcinoma, 21 cases; hypertrophic gastritis, 2 cases; in the remaining 34 cases the gastric mucosa was normal. Attention is drawn to the fact that single test meals should not be relied on as finally conclusive, for a second test in some cases of achlorhydria subsequently showed acid to be present. In the discussion which followed this paper it was pointed out that an incidence of 2% to 3% of achlorhydria in patients with no clinical gastro-intestinal disease was nearer the general experience. It was also mentioned that the neutral red test for true achlorhydria was superior to the histamine method and that when it revealed an acidity atrophic gastritis was always disclosed by gastroscopic examination. The conclusion is therefore strongly suggested that the cause of true achlorhydria is atrophic gastritis.

Bronchial Asthma Treated with Sodium Diphenylhydantoinate.

M. H. SHULMAN (*The New England Journal of Medicine*, February 12, 1942) reports favourable results from the administration of small doses of sodium diphenylhydantoinate ("Dilantin Sodium") to children suffering from severe and frequently recurring bronchial asthma. The initial dosage was one-half grain twice daily; if after one week symptoms persisted, the same dose was given thrice daily; the dosage was increased by one-half grain daily at intervals of one week until the patient reported no asthma and no wheezing on moderate exertion. By this method it was found that one and a half to three grains daily were sufficient to keep the patients free of symptoms. Eczema which was present improved along with the asthma in two of the patients treated.

Brachial Neuritis Occurring in Epidemic Form.

R. WIBURN-MASON (*The Lancet*, November 29, 1941) reports forty-two cases of brachial neuritis, which disease, he states, was epidemic in London in 1941.

Diabetic Acidosis.

A. MIASKY (*The Journal of the American Medical Association*, February 28, 1942) discusses diabetic acidosis. In this condition β -hydroxybutyric and aceto-acetic acids accumulate and cause a depletion of base. The loss of base causes dehydration and intensifies the acidosis. It was assumed that lack of oxidation of carbohydrates caused a lack of oxidation of fats, and from this the ketogenic:antiketogenic ratio theory resulted. The assumption was that ketone bodies were produced in all the tissues of the body, that the diabetic could not oxidize them, and that carbohydrate and insulin stimulated acetone oxidation. This is now known to be incorrect. The isolated liver is the only tissue capable of producing acetone bodies on perfusion with fatty acids.

The liver is the sole site of acetone body formation. Experiments have shown that striated muscles can utilize acetone bodies; but it has been proved that this utilization of acetone by the muscles is not assisted by, and is not in any way due to, oxidation of dextrose, nor is it due to insulin. Nevertheless insulin will alleviate the ketosis of diabetes, and carbohydrate will relieve the ketosis of starvation. Thus insulin and carbohydrate must act on the site of acetone body production, namely, the liver. But the utilization of acetone body by the animals is the same whether the liver is present or not, which indicates that the liver does not burn these bodies to any extent. Thus, although acetone bodies are made by the liver, they are not used there, but are immediately excreted into the blood stream; in other words acetone bodies are not the abnormal products of incomplete fat oxidation, but normal end products of fat metabolism in the liver. Actually a diminution of liver glycogen is the essential prerequisite for increase in fatty acid oxidation, accelerated acetone body formation in the liver and consequent acetonemia. Insulin induces retention of glycogen in the liver, while administration of dextrose stimulates synthesis of glycogen and this adequately explains their antiketogenic actions. In diabetes the liver is poor in glycogen because the breakdown of glycogen is excessive and ketogenesis occurs when the glycogen content falls below some critical low level. Accordingly, if an accumulation of glycogen could be produced, ketosis should cease; and this has been demonstrated in diabetic dogs by intravenous administration of large amounts of dextrose without insulin. Children (and some adults) do not retain glycogen readily, hence their liability to ketosis. The question may be asked, since acetone bodies are normal products of fat oxidation and are utilized freely in diabetic muscles, why they accumulate in the blood stream. The probable answer is that there is a maximum rate at which muscles can utilize acetone bodies. Diabetic acidosis in man develops as a result of deprivation of insulin or as a result of infection. During infections glycogen is not formed so readily from lactic acid, and the breakdown of liver glycogen increases, hence the diminution of liver glycogen leads readily to acidosis in diabetes. It has been said that excess of carbohydrate in diabetics induces the onset of acidosis. The author tested this statement on a group of patients between the ages of 15 and 67. After they had been properly controlled by insulin and diet, the carbohydrate intake was increased up to the subject's limit which varied between 550 and 1,300 grammes daily. The result was increased carbohydrate retention and diminished acetonemia, except in certain cases when insulin was withheld or reduced to an excessively low level.

Persistent Myalgia following Sore Throat.

L. E. HOUGHTON AND E. J. JONES (*The Lancet*, February 14, 1942) describe an epidemic disease among the nursing staff of a hospital in which sore throat was followed in from 8 to 21 days by pains in muscles (flitting from one to another) and severe headache. Pyrexia

and pains persisted for up to five months, and there were severe mental depression, epistaxis and subungual haemorrhages. Bacteriological tests failed to identify any microbe or virus with the disease and no treatment was found to be of any value. All the patients recovered completely.

Sulphapyridine for Complications of Filariasis.

K. V. EARLE (*The Lancet*, November 29, 1941) brings evidence to show that sulphapyridine has no effect upon filariasis, but that it may be very beneficial for such infective complications as cellulitis of devitalized elephantoid tissue and lymphadenitis.

Staphylococcus Aureus Pneumonia.

MAX MICHAEL, JUNIOR (*The Journal of the American Medical Association*, March 14, 1942), reviews the literature and reports some of his own cases of staphylococcal pneumonia in association with infection by the virus of influenza. During the influenza epidemic of 1918 a large proportion of patients developed a picture of overwhelming sepsis with temperature ranging from 104° to 106° F. with frequent remissions. A peculiar "cherry red indigo blue cyanosis" was a regular accompaniment and the sputum was purulent and of a dirty salmon pink colour. There were few signs in the chest, but radiological examination revealed extensive consolidation. In most cases the staphylococcus was isolated on culture from the sputum, the blood count showed a normal or low proportion of white cells and the mortality rate was very high. Pathologically the lungs showed innumerable small abscesses which tended to coalesce. This is the usual picture of cases under review and the importance of the present study lies in the serological investigations which show the double infection by the virus of influenza and the *Staphylococcus aureus*. Repeated serological studies have shown the significance of rises in the titre of neutralizing antibodies for influenza virus in patients with proved influenza infection, such antibodies increasing rapidly after the fifth day of the disease and reaching a maximum ten to fourteen days after the onset. Thus the demonstration of either a very high titre or of a decided increase in protective antibodies against influenza virus in patients is *prima facie* evidence of influenza infection. In three of the five cases reported, definite proof was obtained that influenza A infection had immediately preceded the pneumonia. By intranasal injection of *Staphylococcus aureus* in rabbits, insignificant lesions were produced and influenza virus alone produced a non-fatal disease characterized by either a hemorrhagic consolidation or an interstitial bronchopneumonia. The combination of the two, however, produced a lobular pneumonia and early death. The virus apparently produced such changes in the lungs that bacteria, which in normal animals incited only limited lesions, were enabled to multiply and produce extensive and fatal lesions. Other virus infections may have the same effect. Sulphathiazole therapy seemed to be beneficial and shortened the course of the illness of the three patients who recovered.

British Medical Association News.**THE TREATMENT OF RAPE AND INDECENT ASSAULT ON FEMALES.**

THE two letters appearing hereunder are published at the request of the General Secretary of the Federal Council of the British Medical Association in Australia.

[COPY.]

BRITISH MEDICAL ASSOCIATION, NEW SOUTH WALES BRANCH.
135, Macquarie Street,
Sydney,
27th May, 1942.

The General Secretary,

Federal Council of the British Medical Association in Australia,
135, Macquarie Street,
Sydney.

Treatment of Rape and Indecent Assault on Females.

Dear Sir:

I enclose a copy of a common letter which has been forwarded by the Council of the New South Wales Branch to members.

The Council has directed me to submit the matter to the Federal Council with a recommendation that the Federal Council, if it sees fit, request other Branches to submit the information to their members.

There is one other aspect of this matter which in the Council's opinion merits the consideration of the Federal Council, and that is what subsequent medical action should be taken in the event of the patient becoming pregnant. This matter is one which the Council feels might well be referred by the Federal Council to the Government for consideration.

Faithfully yours,

(Signed) HUGH HUNTER,
Assistant Medical Secretary.

[COPY.]

BRITISH MEDICAL ASSOCIATION, NEW SOUTH WALES BRANCH.
135, Macquarie Street,
Sydney,
27th May, 1942.

Common Letter to Members.

Dear Doctor:

The Council has directed me to advise you of the following recommendations which it has seen fit to make in regard to the immediate treatment of cases of rape and indecent assault on females:

*Treatment of Rape and Indecent Assault on Females:
Immediate Treatment with a view to Preventing
Veneral Infection.*

1. All hospitals to be centres for the relief of these casualties.
2. A strict history to be taken by a member of the Honorary Medical Staff, if available, otherwise by a Senior Medical Officer.
3. A minute examination of the patient to be made.
4. Prophylaxis: Any common approved antiseptic douche to be used. The urethra to be included in this treatment. Calomel Ointment 33½ per cent. to be applied to the genitalia, thighs and cervix. It is further suggested that Sulphathiazole treatment should be given following on the lines for late prophylactic treatment as used in the United States Navy, viz: three (3) grams by mouth at once, followed four (4) hours later by two (2) grams and four (4) by one (1) gram, this being also a preventive against chancroids.
- If there is any history of possible mouth infection, strong Dettol mouth washes should be used and the lips smeared with Calomel Ointment.
- If there is a history of possible rectal infection, the same treatment should be given as for vaginal infection.
5. There should be a routine follow up examination at about weekly intervals, or as deemed necessary.

Whilst the first recommendation states that all hospitals be centres for the relief of these casualties, such recom-

mendation is not to be construed as meaning that all cases should be sent to hospital for treatment. It is only natural that many women, unfortunate enough to be victims of this type of assault, would prefer to be treated privately.

Faithfully yours,

J. G. HUNTER,
Medical Secretary.

National Emergency Measures.**AN ORDER CONTROLLING THE USE OF QUININE.**

THE following order controlling the use of quinine has been promulgated under the National Security (Medical Co-ordination and Equipment) Regulations in the *Commonwealth of Australia Gazette*, Number 233, of August 27, 1942.

In pursuance of regulation 7 of the National Security (Medical Co-ordination and Equipment) Regulations, I, Hibbert Alan Stephen Newton, Acting Chairman of the Central Medical Co-ordination Committee, acting upon the recommendation of the Medical Equipment Control Committee, hereby make the following Order:

1. Paragraph 4 of the Control of Medical Equipment Order is amended by adding at the end of sub-paragraph (2) the words "and in accordance with the requirements of sub-paragraph (1A.) of paragraph 5 of this order".

2. Paragraph 5 of the Control of Medical Equipment Order is amended by inserting the following sub-paragraph after sub-paragraph (1):

"(1A.) A medical practitioner shall not prescribe any of the drugs specified in the Second Schedule to this Order or any preparation or admixture containing any proportion of any drug so specified except for the treatment of malaria, and shall comply with the following provisions when prescribing any such drug, preparation or admixture for the treatment of malaria:

(i) He shall not prescribe a quantity, to be supplied at any one time, exceeding 14 days' supply for the patient when taken in accordance with the directions in the prescription.

(ii) He shall endorse on the prescription the maximum number of times (not exceeding 4) it is to be dispensed, and the words 'For the treatment of malaria only'.

(iii) He shall sign the prescription with his usual signature, and set out therein his own address, the name and address of the person for whom the prescription is given, and the date of issue of the prescription."

Dated this 22nd day of August, 1942.

(Signed) ALAN NEWTON,
Acting Chairman, Central Medical
Co-ordination Committee.

The drugs contained in the Second Schedule are defined in an order issued on March 24, 1942, as "Quinine alkaloid and quinine salts".

AN EMERGENCY MEDICAL SERVICE ORDER.

THE following Emergency Medical Service Order has been promulgated under the National Security (Medical Co-ordination and Equipment) Regulations in the *Commonwealth of Australia Gazette*, Number 230, of August 26, 1942.

In pursuance of regulation 4B of the National Security (Medical Co-ordination and Equipment) Regulations, I, John Curtin, the Minister of State for Defence, hereby order as follows:

Citation.

1. This Order may be cited as the Emergency Medical Service Order.

Charges for Medical Services.

2. The person to whom any medical service is rendered by a member of the Emergency Medical Service who is directed to serve in any position in which the duties include general civil practice, shall pay to the Department of Health the charge specified in the Schedule to this Order in respect of that service.

Members of Friendly Societies.

3. Notwithstanding anything contained in paragraph 2 of this Order, where a member of the Emergency Medical Service performs in any area services of a kind usually included in the practice of a general civil medical practitioner, if any Friendly Society forwards to the Chairman of the State Committee in the State in which the area is situated—

- (a) a notification in writing, prior to the performance of such services by that member, an agreement existed between the Society and a medical practitioner practising in that area under which the medical practitioner performed medical services for members of the Friendly Society in consideration of periodical payments made to him by the Society;
- (b) a copy of the agreement;
- (c) a request that similar medical services be performed by the member of the Emergency Medical Service for members of the Society residing in that area and entitled to medical benefits under the terms of the agreement; and
- (d) an undertaking to make periodical payments to the Commonwealth in accordance with the terms of the agreement in respect of services within the scope of the agreement performed by the member of the Emergency Medical Service for those members,

such payments may be accepted in lieu of the charges payable under paragraph 2 of this Order in respect of the performance of those services by the member of the Emergency Medical Service.

Recovery of Charges due for Medical Services in Respect of Infants.

4. Where any person to whom any medical service is rendered is an infant, the amount due in respect of charges for that service may be recovered from the parent or guardian of the infant.

Payment by Instalments and Waiver of Charges.

5. Where it is established to the satisfaction of the Director-General of the Emergency Civil Medical Practitioner Service that the financial circumstances of any person who is liable to pay any charges for medical services under this Order are such as to justify the payment of the charges by instalments, the Director-General may approve of the payment of the charges by instalments and, in any case in which he is of opinion that payment of the charges by any person would entail serious hardship, the Director-General may waive the liability of that person to pay the charges.

THE SCHEDULE.*Charges for Services of Members of the Emergency Civil Medical Practitioner Service.*

1. Ordinary or uncomplicated cases, at home, hospital or surgery:

	At Home or Hospital.	At Surgery.
	s. d.	s. d.
First visit	10 6	7 6
Second and subsequent visits	7 6	7 6

2. Surgical dressings—Cost.

3. Mileage—

Country.—Two miles free. Beyond two miles (one way only), 8 a.m. to 8 p.m., at the rate of 5s. per mile; 8 p.m. to 8 a.m. at the rate of 7s. 6d. per mile.

Metropolitan.—Two miles free. Beyond two miles (one way only), 8 a.m. to 8 p.m. at the rate of 3s. 6d. per mile; 8 p.m. to 8 a.m. at the rate of 5s. per mile.

Mileage charges so payable shall be calculated from the doctor's surgery.

4. Assisting at operations—

	f s. d.
Major operation	2 2 0
Minor operation	1 1 0

5. Administering anaesthetic—

	f s. d.
Major operation	3 3 0
Minor operation	1 1 0

Where special anaesthetic is given, such special charge as is agreed upon.

6. The following charges for specified procedures are total charges (including charges for after attendance, but not previous attendance) in uncomplicated cases.

Simple and Uncomplicated.

(a) Fractures—	f s. d.
Nasal bones	2 12 6
Metacarpal—one or more	3 3 0
Metatarsal—one or more	4 14 6
Phalanx—one	2 2 0
Phalanx—more than one	3 3 0
Carpal bone—other than navicular	3 3 0
Navicular	5 5 0
Tarsal bone	5 5 0
Os calcis or os talus	10 10 0

Forearm or leg—

One bone (shaft)—	f s. d.
Radius	6 6 0
Ulna	5 5 0
Tibia	9 9 0
Fibula	5 5 0

Two bones (shafts)—	f s. d.
Forearm	9 9 0
Leg	14 14 0

Colles	7 7 0
Pott's	11 11 0
Femur	21 0 0
Humerus	12 12 0
Clavicle	5 5 0
Scapula	5 5 0

Patella—	f s. d.
Without operation	5 5 0
Open operation	15 15 0

Mandible	f s. d.
Maxilla	6 6 0
Pelvis	4 4 0
Ribs	12 12 0
	2 12 6

(b) Compound Fractures.—Charge for compound fractures shall be 25 per cent. more than that for simple fractures.

(c) Fractures requiring open operation shall be 33½ per cent. more than for simple fractures.

(d) Visceral injuries complicating fractures shall be regarded as additional injuries.

7.—

(a) Dislocations—	f s. d.
Mandible	2 2 0
Clavicle	6 6 0
Shoulder	5 5 0
Elbow	6 6 0
Wrist	4 4 0
Digit	2 2 0
Hip	12 12 0
Knee	10 10 0
Patella	4 4 0
Ankle	7 7 0
Tarsus	4 4 0

(b) Dislocations requiring open operation or complicated by joint involvements shall be 33½ per cent. more than for simple dislocation.

8. Amputations—	f s. d.
Digit—one	4 4 0
two or more	5 5 0
Hand, forearm or arm	10 10 0
Shoulder disarticulation	21 0 0
Foot, leg or knee	15 15 0
Thigh	21 0 0
Hip disarticulation	21 0 0

9. Special operations or procedures—

Trehilining or resection of part of skull	21 0 0
Laminectomy	21 0 0

Hernia—

Operation	12 12 0
Double or strangulated single	18 18 0

Paracentesis thoracis	2 2 0
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Laparotomy and operations on abdominal viscera	21 0 0
Semilunar cartilage (removal of)	14 14 0

Catheterization urethra	1 1 0
Enucleation of eye	10 10 0

Blood transfusion	10 10 0
Suture of tendon—	

One only	5 5 0
Two or more	8 8 0

Suture of nerve trunk—	
One only	7 7 0

Two or more	12 12 0
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	f s. d.
Tapping hydrocele	1 1 0
Injection of varicose veins or haemorrhoids (per treatment)	1 1 0
Cystoscopy	3 3 0
Circumcision—infants	2 2 0
Circumcision—adults	5 5 0
Tonsillectomy—children	5 5 0
Tonsillectomy—adults	10 10 0
10. Midwifery, to include ordinary ante-natal care and post natal attendance to the tenth day—5s.	
11. Payments for two or more operations performed at the one time are not cumulative. The charge for the main operation shall be paid in full, and, in addition, 50 per cent. of the specified charge shall be payable for each additional operation.	
12. The charge for the treatment prior to operation and the charge for the operation shall be cumulative.	
13. Total charges include after-treatment, but do not include previous attendance or—	
(a) the cost of dressings;	
(b) mileage;	
(c) charges of other Doctors, Assistants, Anaesthetists, Pathologists, Radiologists or other Assistants; or	
(d) Masseur's fees.	
14. Where the charge is specified for visit or consultation in the surgery, such charge embraces treatment for minor procedures only, such as suturing of small wounds &c.	
15. Fractured skull—	
Without operation—visit (as specified for visits under paragraph 1).	
Fractured spine—	
Without operation—visit (as specified for visits under paragraph 1).	
16. Pathology.—At the Commonwealth Health Laboratory scale of charges.	
17. In procedures not specified in this Schedule, the charges shall be the same as those for specified cases and procedures of approximately equal magnitude.	

Dated this nineteenth day of August, 1942.

JOHN CURTIN,
Minister of State for Defence.

Correspondence.

THE BLOOD GROUPS: THE RH FACTOR AND THE M AND N FACTOR.

SIR: In the issue of this journal, dated August 8, 1942, a letter from Dr. A. E. Finckh appeared under the title "The Blood Groups: The Rh Factor and the M and N Factor". Certain remarks made by Dr. Finckh need amplification, as misunderstanding by readers may result. He states "that the difficulties in the preparation of the test sera 'M' and 'N' bristles with such difficulties that its preparation in Australia will be out of the question for years".

In 1940 work was commenced at the Commonwealth Serum Laboratories upon the preparation of M and N testing fluids. As a result, an article entitled "A Note on the Preparation and Use of M and N Testing Fluids" appeared in the issue of this journal dated October 25, 1941, by R. T. Simmons, Lucy M. Bryce, J. J. Graydon and Harold Wilson. In this paper attention was drawn to the stringent safeguards which would be necessary if the determination of M and N blood types were to be put to forensic use in Australia.

A second paper on the blood groups, subgroups and M and N types of pure-blooded Australian aborigines is now in course of preparation. About two thousand samples of blood have been tested successfully in both investigations.

These investigations ceased some little time ago owing to the pressure of war work, but it is interesting to note that the potent specific testing fluids which were prepared in 1940 are still found to be fully potent today; no appreciable loss of titre having occurred.

Recently work has also commenced on the Rh factor at a research institute in Melbourne.

Nevertheless Dr. Finckh has very advisedly brought to notice again the necessity of careful handling of tests for M and N agglutinogens by a restricted number of laboratories specially equipped and practised in such work.

I have been advised by those competent to judge that the greatest care should be exercised in the use of M and N sera and their opinions are supported by the best British

and American authorities on the subject. On this basis we have been compelled to refuse for the present to distribute such stocks of sera that we possess.

During last year I made representation to various competent authorities that consideration should be given to the organization and selection of laboratories in capital cities which would be competent to undertake such work. For the present the matter rests there. Perhaps it is impracticable to organize such centres in the present war emergency.

Yours, etc.,

F. G. MORGAN,
Director, Commonwealth Serum Laboratories.

Commonwealth Serum Laboratories,
Parkville, N.Z.,
Victoria.

August 31, 1942.

QUININE IN WARTIME OBSTETRICS.

SIR: Circumstances have placed me in the position of being able to view this problem from both obstetric and service angles.

It would seem to me that the question can be answered briefly in the following manner. Quinine is a specific cure of malaria and a dire necessity in the prosecution of the northern offensive.

Quinine is a useful adjunct in obstetrics. It is, and always has been, however, the source of debate and difference of opinion among obstetricians. The liberty to have any opinion at all depends on the outcome of a death struggle which is rapidly reaching its climax on our very own doorstep. Such a position demands a bold decision made by ourselves in touch with the reality of a background of war for the very survival of our women, obstetric or otherwise—not a decision made for us by quoted authorities living in the tranquillity of peace-time obstetrics.

To try and conclude a debate which has existed for many years by quoting the varying opinions of authorities will be productive of very little good under the present circumstances. If such be the wish of any of my colleagues and were it to meet, Sir, with your approval, one could devote this entire communication to quoting obstetric personalities and research to uphold and deprecate the use of quinine in obstetrics. I sincerely trust that such unproductive energy can be conserved for more urgent work. Facing reality, however, we must ask and answer the question: What are we to use as a substitute for the time being?

First of all, let us remember that as Britshers our natural instinct is to be wholeheartedly thorough in our methods. We cannot (and it is surely to our credit) be satisfied that any *Ersatz* will reach the standard of the real thing. We must not, therefore, expect that a substitute will be thoroughly satisfactory.

I take it that quinine in obstetrics finds its use mainly (i) as an adjunct in the induction of labour; (ii) as a component of the well-known quinine, ergot and strychnine ("Q.E.S.") mixture or tablet.

We can quickly dispose of the second use. The omission of quinine from the "Q.E.S." mixture or tablet will reduce its efficiency somewhat, but this is not vital to the treatment of conditions for which "Q.E.S." is used. Ergot is also a strong uterine contractor and in the treatment of uterine sepsis we have a much more valuable drug in the sulphonamide and its relatives. Induction of labour is the more important question. I submit the following answer.

The most successful mode of induction of labour is rupture of the membranes, *plus* pituitrin or pitocin. Of latter years it has largely replaced medical induction by quinine. It is simple and reliable to an extraordinarily high degree, shortens labour in many cases and has not caused an increase in puerperal sepsis or foetal complications. In three special types of cases, however, it is unwise to use this method: (i) suspected disproportion, (ii) "floating" head, (iii) malpresentation.

In these cases quinine may be desirable, but is it absolutely essential? It is difficult to give an honest "yes" to this question. In suspected disproportion induction of labour by quinine is not by any means a solution of the difficulty. Many cases refuse to come into labour at the time we decree they should and hundreds of grains of quinine can be wasted in this manner. Quinine which has produced no obstetric result has been wasted. Waste of quinine at present is "criminal folly", unintentional though it may be.

Trial labour and Cæsarean section is an alternative. Trial labour is a more satisfactory test of Nature's ability when it

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is spontaneous in onset than when induced. You will retort that this will mean a rise in the number of Cesarean sections. I don't think so; if it does it will be a very small rise. Human judgement is difficult and the vast majority of suspected disproportions turn out to be normal or instrumental labours. This surely means that the majority of quinine inductions for this difficulty are unnecessary. Waste of quinine is criminal folly while soldiers, sailors and airmen sweat and shiver. Their need is surely greater.

A "floating" head in a severe toxæmia or other complication of pregnancy will be a knotty problem. If disproportion can be confidently ruled out, one might consider the employment of bougies, although as a mode of induction one dislikes them. A modified medical induction might be tried, using castor oil one ounce, an enema and five half-hourly injections of three minims of pituitrin or pitocin. Such a measure should be employed with restrained optimism. In malpresentation the risk of prolapse of the cord precludes the use of rupture of the membranes. Skill in obstetric manipulation, not induction of labour, is the solution of this difficulty.

Finally, we can take comfort from these two facts: (i) It is not to be forever. (ii) War in its frightfulness causes people to dynamite their water supplies, to burn their homes and factories and sacrifice their cattle and crops. I think the temporary suspension of quinine in obstetrics is a sad comment on the serious state of the Pacific war. Those whose difficult task it is to make such an unprecedented decision are justified by equally unprecedented circumstances.

Yours, etc.,

BRUCE T. MAYES,

Professor of Obstetrics (on
leave), University of Sydney.

September 1, 1942.

Naval, Military and Air Force.

APPOINTMENTS.

THE following appointments, changes *et cetera* have been promulgated in the *Commonwealth of Australia Gazette*, Number 232, of August 27, 1942.

PERMANENT NAVAL FORCES OF THE COMMONWEALTH (SEA-GOING FORCES).

Appointments.—Leo Frank Cotton is appointed Temporary Surgeon Lieutenant (D), dated 3rd August, 1942.

ROYAL AUSTRALIAN AIR FORCE.

Citizen Air Force: Medical Branch.

Harry Stephenson Lucraft, M.B., Ch.B., M.D., D.T.M. & H., M.R.C.P., F.R.A.C.P. (6376), is appointed to a commission on probation with the rank of Flight Lieutenant (Temporary Squadron Leader) with effect from 10th July, 1942.

The following Temporary Squadron Leaders are granted the acting rank of Wing Commander whilst occupying Wing Commander posts with effect from the dates indicated: P. R. Delamoth (1235), 6th May, 1942; F. G. Steele (1601), 5th May, 1942.

The following Flight Lieutenants are granted the acting rank of Squadron Leader whilst occupying Squadron Leader posts with effect from the dates indicated: F. I. Wooten (1198), 11th June, 1942; I. L. Miller (1230), R. Greenlees (1231), C. A. McHardy (1539), 1st June, 1942; E. J. Davies (1504), 11th June, 1942; R. G. Tonkin (1659), 13th June, 1942; J. K. Gabriel (2085), H. J. R. Gamble (1685), 1st June, 1942.

Flying Officer A. A. Roper (1864) is granted the acting rank of Flight Lieutenant whilst occupying a Flight Lieutenant post with effect from 11th June, 1942.

CASUALTIES.

ACCORDING to the casualty list received on September 1, 1942, Captain J. P. Higgin, A.A.M.C., Cronulla, New South Wales, is reported to be missing abroad.

According to the casualty list received on September 2, 1942, Captain J. E. R. Clarke, A.A.M.C., Brisbane, Queensland, is reported to be missing overseas.

Obituary.

ROBERT USHER RUSSELL.

DR. ROBERT USHER RUSSELL, whose death was recorded recently in these pages, was a son of Dr. V. W. Russell, of Tipperary, and studied medicine at Dublin and Edinburgh. He had travelled extensively before settling in Australia, where he spent the greater part of his time in the civil service. His first appointment was in 1886 for a short period to Rydalmer Hospital. In 1890 he was appointed to Parramatta Mental Hospital where he acted as junior and later senior medical officer. In 1896 he was appointed medical superintendent of the Coast Hospital, and in 1898 medical superintendent of the Mental Hospital, Newcastle, where he remained until his retirement in 1922. During this period he acted for many years as Port Health Officer to Port Hunter at a time when the port was always crowded with sailing ships seeking coal. He was also in charge of the Reception House, Newcastle, and on the opening of the mental hospitals at Stockton and Morisset was appointed to visit them. He also visited for some years the mental hospital at Rabbit Island. He was always interested in amateur sport and participated in cricket and shooting and was a keen club man. For many years he was a captain in the Australian Army Medical Corps until 1919, both as regimental medical officer and a member of a field ambulance.

ARTHUR ALBERT CROOKE.

We regret to announce the death of Dr. Arthur Albert Crooke, which occurred on July 5, 1942, at Dunolly, Victoria.

Australian Medical Board Proceedings.

NEW SOUTH WALES.

THE undermentioned have been registered, pursuant to the provisions of the *Medical Practitioners Act, 1938-1939*, of New South Wales, as duly qualified medical practitioners:

Williams, Josephine Margaret Mary, M.B., B.S., 1939 (Univ. Adelaide), Flat 53, Marton Hall, Margaret Street, Sydney.

Edmonds, Archibald Roy, M.B., B.S., 1942 (Univ. Melbourne), Base Hospital, Lismore.

The following additional qualifications have been registered:

MacMahon, Christine Helen Mary (M.B., B.S., 1930, Univ. Sydney), D.P.M., 1942, Broughton Hall, Leichhardt.

Sibree, Eric Wilberforce (M.B., B.S., 1936, Univ. Sydney), M.D., 1941 (Univ. Sydney), Australian Imperial Force.

Yeates, James Macrae (M.B., 1936, Univ. Sydney), F.R.C.S., 1940, Australian Imperial Force.

The following change of name has been registered: Macintosh, Isobel Patricia, M.B., B.S., 1941 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown, name now, Waugh, Isobel Patricia.

SOUTH AUSTRALIA.

THE undermentioned have been registered, pursuant to the provisions of the *Medical Practitioners Act, 1919 to 1935*, as duly qualified medical practitioners:

Goodchild, Muriel Clare, M.R.C.S., 1935 (England), L.R.C.P. (Univ. London), Children's Hospital, Adelaide.

Urban, Friedrich, M.B., B.S., 1942 (Univ. Adelaide), Adelaide Post Office.

Stewart, John Stewart McKellar, M.B., B.S., 1942 (Univ. Adelaide), Royal Adelaide Hospital, Adelaide.

Posener, Karl Josef, M.B., B.S., 1942 (Univ. Adelaide), University of Adelaide, Adelaide.

Texler, Eva, M.B., B.S., 1942 (Univ. Adelaide), Hutt Street, Adelaide.

Kekwick, Daintree Ned, M.B., B.S., 1942 (Univ. Adelaide), Royal Adelaide Hospital, Adelaide.

Eyles, Phillip Sydney, M.B., B.S., 1942 (Univ. Adelaide), Royal Adelaide Hospital, Adelaide.

Notice.

THE honorary medical staff of Saint Vincent's Hospital, Melbourne, will hold a meeting at the hospital on Wednesday, September 16, 1942, at 8.15 o'clock p.m. Major W. R. Halloran (U.S.A.F.I.A.) will speak on "The Electrocardiographic Diagnosis of Auricular and Ventricular Infarction" and Major W. B. Wartman (U.S.A.F.I.A.) on "The Pathology of Coronary Artery Occlusion". Members of the British Medical Association are invited to attend the meeting.

A "Professor Schlotz (original) tonometer", manufactured in Norway, has been stolen from Prince Henry's Hospital, Melbourne. Should this instrument be offered for sale to any doctor, it is requested that Detective Cameron, Detective Office, St. Kilda Road, Melbourne, be notified immediately.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Sterling-Levis, Miles, M.B., B.S., 1937 (Univ. Sydney), c/o Bank of New South Wales, Head Office, 341, George Street, Sydney.
 Tyrer, John William Howard, M.B., B.S., 1942 (Univ. Sydney), 227, Old South Head Road, Bondi.
 Waugh, Isabel Patricia (registered as Macintosh), M.B., B.S., 1941 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.

Medical Appointments.

Dr. John Stewart McKellar Stewart and Dr. Daintry Ned Kekwick have been appointed Resident Medical Officers at the Royal Adelaide Hospital, South Australia.

Dr. Horace Edgar Dunstone has been elected a member of the East Torrens County Board of Health by the St. Peters Local Board of Health, South Australia, pursuant to the provisions of the *Health Act*, 1935-1940.

Dr. Alexander Hamilton Dobbin and Dr. Frederick John Jude have been appointed Public Vaccinators for Victoria.

Books Received.

"Our Russian Front", by Anna Louise Strong; 1942. Sydney: Angus and Robertson Limited. Crown 8vo, pp. 260. Price: 8s. 6d. net.

"Music for Pleasure", by Neville Cardus; 1942. Sydney: Angus and Robertson Limited. Demy 8vo, pp. 116. Price: 2s. 6d. net.

"The Adolescent Criminal: A Medico-Sociological Study of 4,000 Male Adolescents", by W. Norwood East, M.D. (London), F.R.C.P. (London), in collaboration with Percy Stocks, M.A., M.D., B.Ch., D.P.H. (Cambridge), and H. T. P. Young, M.B., Ch.B. (Edinburgh), with foreword by Sir Alexander Maxwell, K.C.B., K.B.E.; 1942. London: J. and A. Churchill Limited. Crown 4to, pp. 340, with 112 tables. Price: 45s. net.

"Handbook of Practical Bacteriology: A Guide to Bacteriological Laboratory Work", by T. J. Mackie, M.D., D.P.H., and J. E. McCarty, M.D., D.Sc.; Sixth Edition; 1942. Edinburgh: E. and S. Livingstone. Crown 8vo, pp. 488, with illustrations. Price: 17s. 6d. net.

"The Natural Development of the Child (A Guide for Parents, Teachers, Students, and Others)", by Agatha H. Bowley, Ph.D., with foreword by D. R. MacCalman, M.D.; 1942. Edinburgh: E. and S. Livingstone. Crown 8vo, pp. 190, with 84 photographic illustrations. Price: 8s. 6d. net.

"The Pleuro-Subpleural Zone: Its Clinical and Experimental Investigation and its Practical Importance in Chest Pathology", by J. Skládal; 1942. Cambridge: Cambridge University Press. Demy 8vo, pp. 114, with 11 plates and 20 illustrations. Price: 10s. 6d. net.

"Aids to Osteology", by Nils L. Eckhoff, M.S. (London), F.R.C.S.; Fourth Edition; 1942. London: Baillière, Tindall and Cox. Foolscape 8vo, pp. 272, with 42 illustrations. Price: 6s. net.

"Health in the Soviet Union", by R. S. Ellery, M.D., F.R.A.C.P.; 1942. Melbourne: Rawson's Bookshop. Demy 8vo, pp. 48. Price: 6d. net.

"Mission to Moscow", a record of confidential dispatches to the State Department, official and personal correspondence, current diary and journal entries, including notes and comment up to October, 1941, by Joseph E. Davies; 1942. Sydney: Angus and Robertson Limited. Demy 8vo, pp. 532, with illustrations. Price: 14s. 6d. net.

"Vade Mecum of Medical Treatment", by W. Gorden Sears, M.D. (London), M.R.C.P. (London); Third Edition; 1942. London: Edward Arnold and Company. Crown 8vo, pp. 396. Price: 10s. 6d. net.

Diary for the Month.

SEPT. 15.—New South Wales Branch, B.M.A.: Ethics Committee.
 SEPT. 16.—Western Australian Branch, B.M.A.: Branch.
 SEPT. 17.—New South Wales Branch, B.M.A.: Clinical Meeting.
 SEPT. 22.—New South Wales Branch, B.M.A.: Medical Politics Committee.
 SEPT. 24.—New South Wales Branch, B.M.A.: Branch.
 SEPT. 24.—South Australian Branch, B.M.A.: Branch.
 SEPT. 25.—Federal Council of the B.M.A. in Australia: Meeting in Melbourne.
 SEPT. 25.—Queensland Branch, B.M.A.: Council.
 SEPT. 25.—Tasmanian Branch, B.M.A.: Council.
 OCT. 1.—South Australian Branch, B.M.A.: Council.
 OCT. 2.—Queensland Branch, B.M.A.: Branch.
 OCT. 6.—New South Wales Branch, B.M.A.: Council Quarterly.
 OCT. 7.—Western Australian Branch, B.M.A.: Council.
 OCT. 9.—Queensland Branch, B.M.A.: Council.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phoenix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

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